CHAPTER 5

AIRCREW SURVIVAL EQUIPMENT TRAINING

During the Southeast Asian conflict, a precedent of immediate rescue was established. The average period of individual, isolated survival for aircrew members that were rescued was 6 hours. The average time in the southwest Pacific during World War II was 48 hours in 85 percent of the cases reported. The marked reduction in times can be attributed to a number of factors, including aircrew familiarity with equipment, efficiency of air rescue and/or recovery forces, more effective communications devices, rotary-wing rescue vehicles, and most significantly, the prevailing low-threat air environment. However, in a future major conflict, the United States cannot expect to have the same air superiority that it had in Southeast Asia.

The United States now anticipates a sophisticated high-threat air environment with a wide spectrum of antiaircraft weapons. We can expect greater combat losses with more downed aircraft and aircrew members. The fate of search and rescue (SAR) helicopters and their support aircraft is in doubt against an enemy equipped with modern air defense weapons. Thus, U.S. military personnel must be prepared both mentally and physically for long-term solitude, as well as group survival, with all of the problems involved, until rescue can be effected.

The basic skills for survival have never changed. The will to live and survive is still the most important single factor in bringing aircrewmen home alive.

Today's survival equipment used by aircrewmen has been improved over the past 10 years to a point where, with a little common sense and proper instruction on its use, the aircrewman has a better chance of survival than ever before.

Until now you have inspected, tested, and packed survival items. Maybe on occasions you have been required to give a lecture on the use of survival items. As a first class or chief petty officer, it is essential that you be familiar with survival equipment and ensure flight personnel are trained in its use. The following manuals and instructions will aid you in your research for information about the survival environment and equipment usage. NWP 19-1 is the Navy's SAR manual. This manual describes all aspects of search, rescue, and the equipment used in rescue operations. The NAVAIR 00-80T-101, *Survival Training Manual,* is a recently published manual with which you may not be familiar. It describes the use of survival equipment and rescue devices carried by Navy aircrewmen and SAR vehicles. This includes electronic, pyrotechnic, and survival equipment, as well as specialized SAR rescue equipment. *The NATOPS General Flight and Operating Instructions,* OPNAVINST 3710.7, provides general information about minimum requirements for aircrew personnel protection equipment and training.

SEA SURVIVAL

Most naval aircraft are equipped for and routinely fly over water; so chances are, a high percentage of our survival situations will involve the sea. All aircrewmen flying in naval aircraft have received training in water survival, and most are good swimmers. You will not be involved in teaching swimming. Your job is to instruct the aircrewman in the use of available survival equipment.

If you are to survive in the sea, you will have to remain calm and use sound judgment; panic will be your worst enemy. Mental preparation and practice will allow you to use your fear constructively. You should mentally rehearse your actions many times so that when you are forced to act, it will be from conditioned reflex. By the time you reach the water, whether by parachute or crash landing, you will know your situation and begin to apply established priorities. It is beyond the scope of this text to attempt to detail every survival scenario. However, you will improve your chances to survive in the sea, despite the variable factors such as environmental conditions, sea

state, and physical condition, by using common sense in applying the following priorities to meet your unique situation:

1. Flotation
2. First aid
3. Shelter
4. Location
5. Water
6. Food

FLOTATION

It stands to reason flotation should be your highest priority when you enter the sea. There are

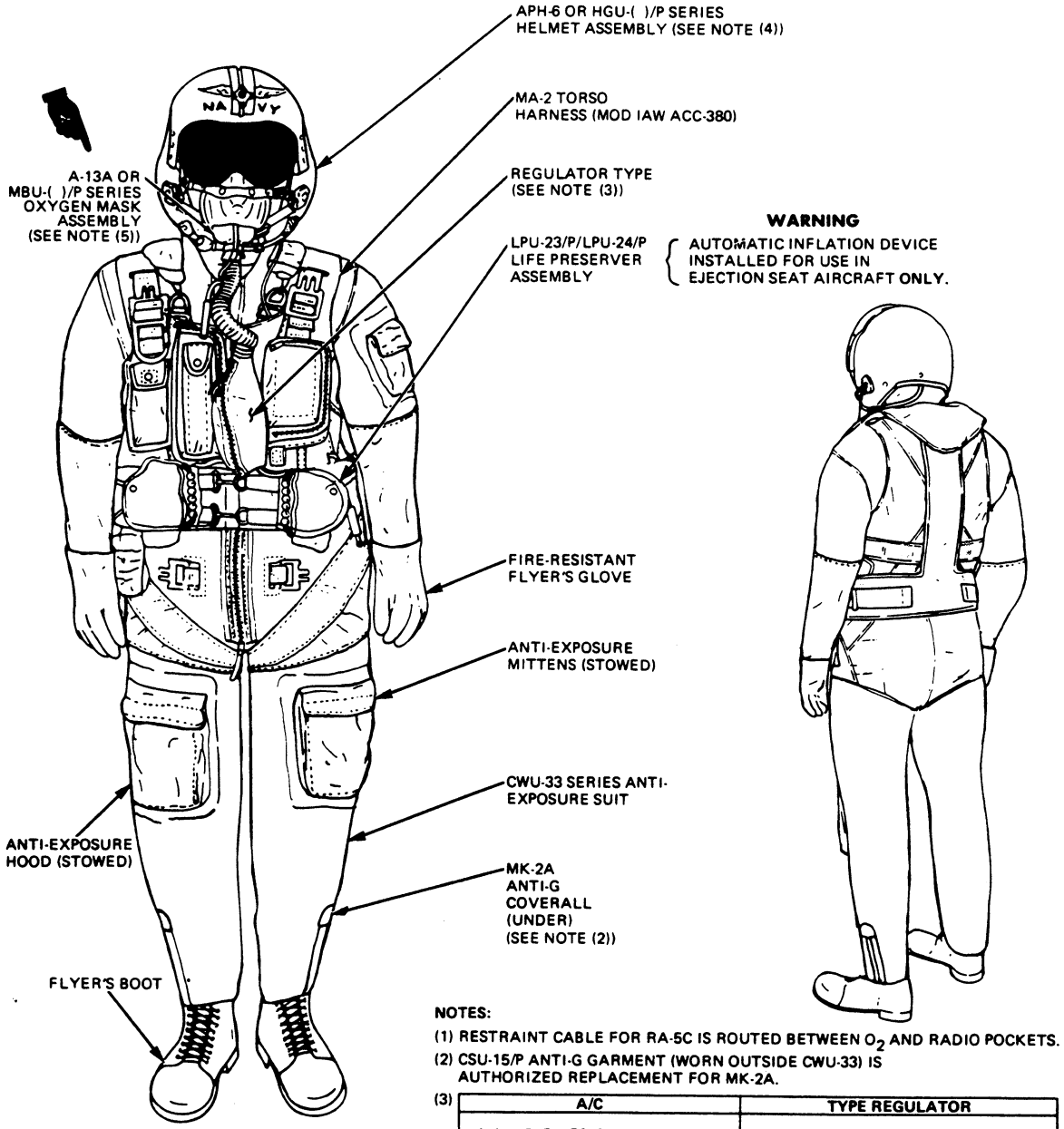

Figure 5-1.—Personal survival equipment.

a number of ways to stay afloat. Figure 5-1 shows the personal equipment worn by the VA, VF, or VS aircrewman. The primary flotation device shown is the LPU life preserver; however, a closer look reveals that the aircrewman is also wearing **an** anti-g suit. This g suit is an excellent flotation device itself. When the aircrewman orally inflates the g suit, it provides additional emergency flotation.

NOTE: In the event the g suit becomes the only flotation device, it should be removed from the legs and worn as water wings. If left on the legs and inflated, it could cause the aviator to become inverted in the water (head down).

Life Preservers

Many different types of life preservers are used by naval aviation personnel. The Mk-1 is used by maintenance personnel working aboard ship. The LPU-30/P is used as a substitute for the LPP life preserver aboard carrier-onboard-delivery (COD) and vertical-onboard-delivery (VOD) aircraft. The LPP life preservers are worn by passengers flying in naval aircraft. The LPA-2B and the LPU-21B/P are worn by aircrewmen flying in nonelection-seat-equipped aircraft. The LPU-23A/P and the LPU-24A/P are worn by aircrewmen flying in ejection-seat-equipped aircraft. These two life preservers are equipped with automatic inflation systems in addition to the manual actuation systems. The FLU-8A/P automatic inflation feature will be explained later in this chapter.

Each of the life preservers we will discuss is equipped with CO_2 cylinders that will inflate the preserver once it is actuated. Manual activation of the CO_2 cylinders on life preservers requires only a simple pull on the beaded handle or toggle shown in figure 5-2. Life preservers inflate

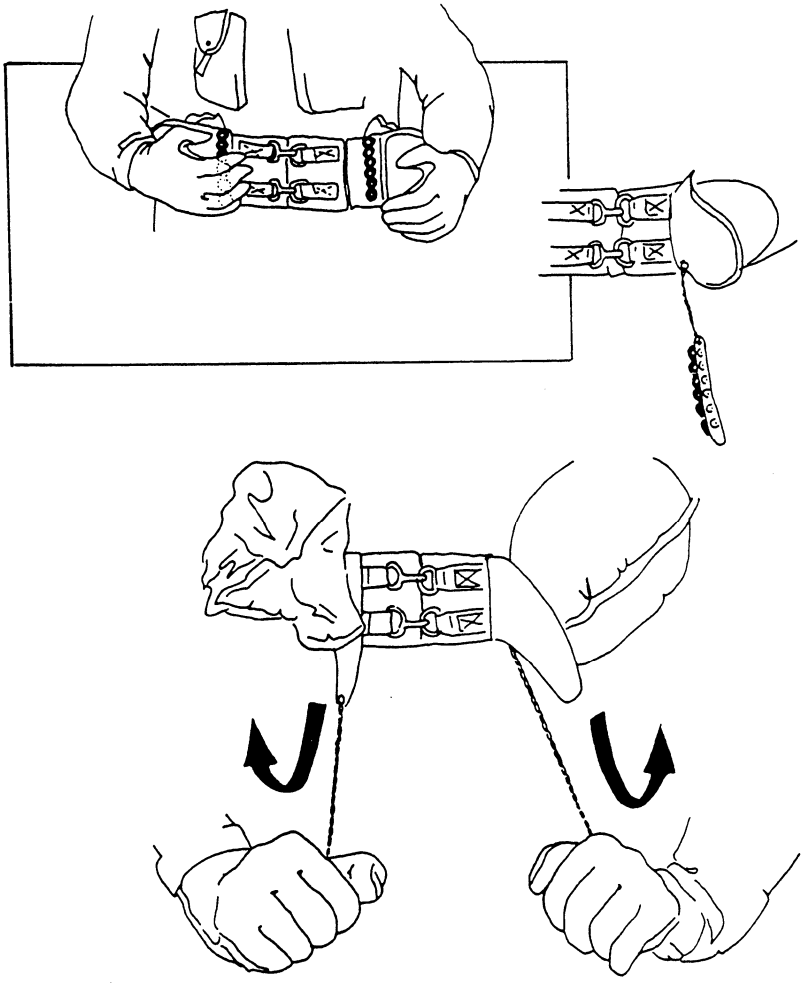

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Figure 5-2.—LPA inflation.

to their designed shape within 30 seconds; however, depending on ambient temperature, they may require additional air pressure. Air pressure can be added by unscrewing the locking device, pushing in on the valve, and blowing air into the preserver through the oral inflation tube. The LPU-23A/P or the LPU 24A/P life preserver assemblies have an automatic inflation device designated the FLU-8A/P.

The FLU-8A/P automatic inflation assembly consists of a body assembly and a sensor housing. The body assembly contains a cartridge, piercing pin, spent-cartridge indicator, firing check port, packing loop, cam lever, lanyard assembly, and nylon release pin. The body assembly also provides for the attachment of a charged CO_2 cylinder. The sensor housing contains an electronic circuit, two batteries, and a sensor plug assembly containing the battery contact spring and the sensor pin. The inflation devices are attached to each valve stem located on the waist lobes. In addition, a beaded handle with a manual inflation lanyard is connected to each inflation device.

NOTE: The FLU-8A/P can be operated either manually or automatically, although the manual mode is considered the primary mode.

MANUAL MODE.— The attached lanyard assembly, when pulled, rotates the cam lever, releasing the packaging loop lanyard from the nylon release pin and forcing the piercing pin into the diaphragm of the CO_2 cylinder. The CO_2, under pressure, is forced through the body of the device to inflate the life preserver.

AUTOMATIC OPERATION.— The secondary operating mode is automatic. Upon immersion in freshwater or salt water, a conducting path is established between the sensor pin and the case, completing the electrical circuit. A resistance network requires the conductivity of the water to be at an established minimum. If the conductivity is present, two series-connected, dry-storage batteries energize the electronic circuit, which then discharges to fire the cartridge. Ballistic energy, produced by the burning cartridge, forces the spent-cartridge indicator pin into the firing check port and propels the piercing pin into the diaphragm of the CO_2 cylinder. As the piercing pin moves forward, the packaging loop lanyard is released from the body of the inflator. The CO_2, under pressure, is forced through the body of the device to inflate the life preserver.

NOTE: The FLU-8A/P is an emergency backup system. Always, if possible, manually inflate the LPU prior to water entry.

These life preservers provide buoyancy that ranges from 29 to 65 pounds. This may confuse the aircrewmen; so it should be pointed out that this is the minimum buoyancy the preserver provides and that the natural buoyancy of the body provides additional

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Figure 5-3.—Aircrewman grasping shoulder straps.

buoyancy. An LPP life preserver that provides a buoyancy of 29 pounds is more than sufficient to keep a 200-pound man afloat for an indefinite length of time.

OPERATIONAL DIFFICULTIES OF LIFE PRESERVERS.— With all the equipment worn by aviators, life preservers must completely inflate to provide the buoyancy necessary to keep them afloat.

Partial inflation of the collar lobe on the LPA and LPU life preservers is a reported problem. Improper functioning of the hook-and-pile tapes that hold the collar lobes in the packed condition causes this problem. If the hook-and-pile tapes fail to open, simply pull them apart and the preserver will fully inflate the collar lobe.

BAILOUT PROCEDURES USING THE FOUR-LINE RELEASE AND THE LPA LIFE PRESERVER.— Each aircraft has its own bailout procedure. The Naval Air Training and Operating Procedures Standardization (NATOPS) manual outlines the emergency procedures for each aircraft. We will discuss the emergency egress procedures for the P-3 aircraft.

When the command is given to bail out, the aircrewmen don their parachutes. We are using the NB-8 personal parachute to describe the bailout procedures. Grasp the shoulder straps as shown in figure 5-3 and place the parachute onto your back (fig. 5-4). Use the quick-release snap and the V-ring to attach the chest strap in place (fig. 5-5).

When you are donning the parachute over the LPA/LPU life preserver, be sure the harness

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Figure 5-4.—Aircrewman slinging parachute onto back.

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Figure 5-5.—Aircrewman attaching quick release V-ring.

does not cross the collar lobes of the flotation device. This could restrict inflation. The parachute should fit tightly, high on the back, and snugly in the seat. Before you tighten the chest straps (fig. 5-6), attach the leg straps as - shown in figure 5-7. Prior to bailout, ensure the main sling is well under the buttocks before you tighten the leg straps. It should be lowered under. your buttocks as shown in figure 5-8 and the leg straps tightened (fig. 5-9). At this point you will not be able to stand erect.

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Figure 5-6.—Aircrewman tightening chest strap.

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Figure 5-7.—Aircrewman attaching leg straps.

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Figure 5-8.—Aircrewman lowering seat strap.

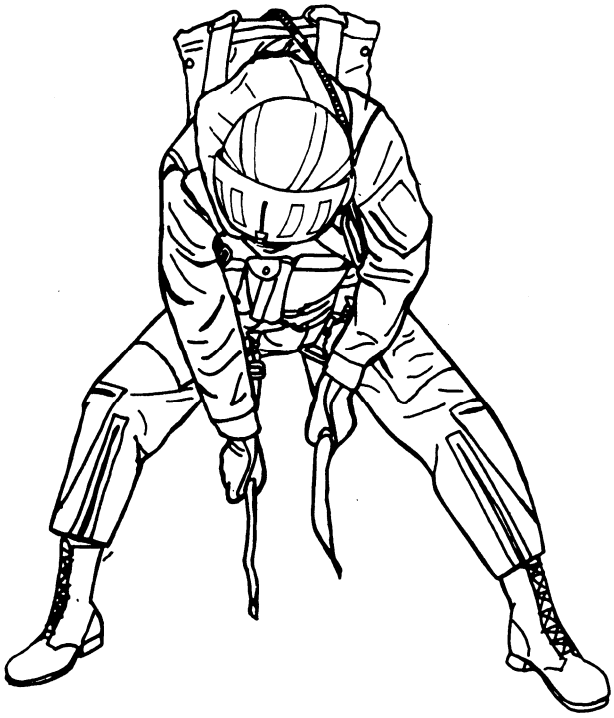

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Figure 5-9.—Aircrewman tightening leg straps.

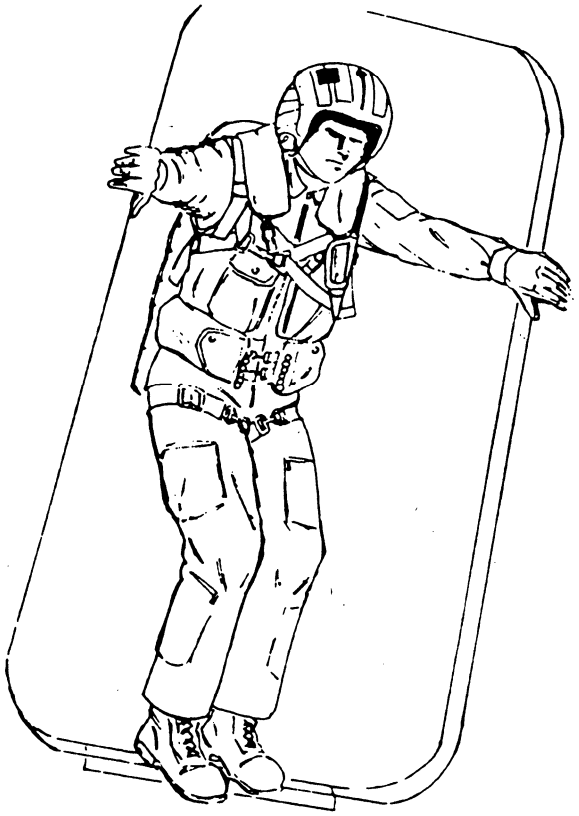

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Figure 5-10.—Aircrewman preparing to exit aircraft.

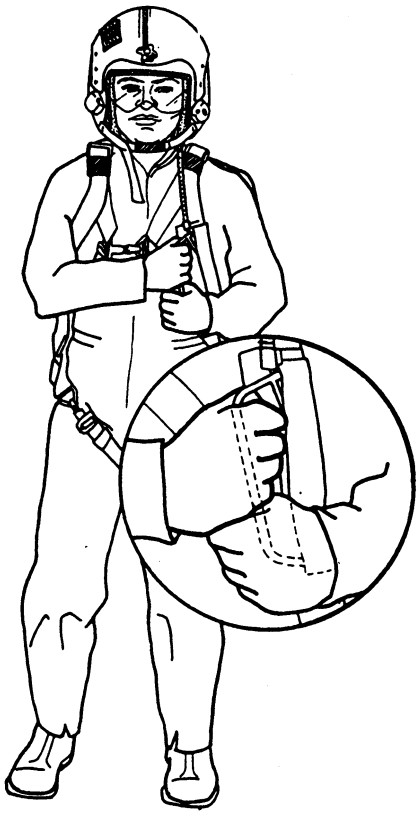

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Figure 5-11.—Aircrewman gripping rip cord handle.

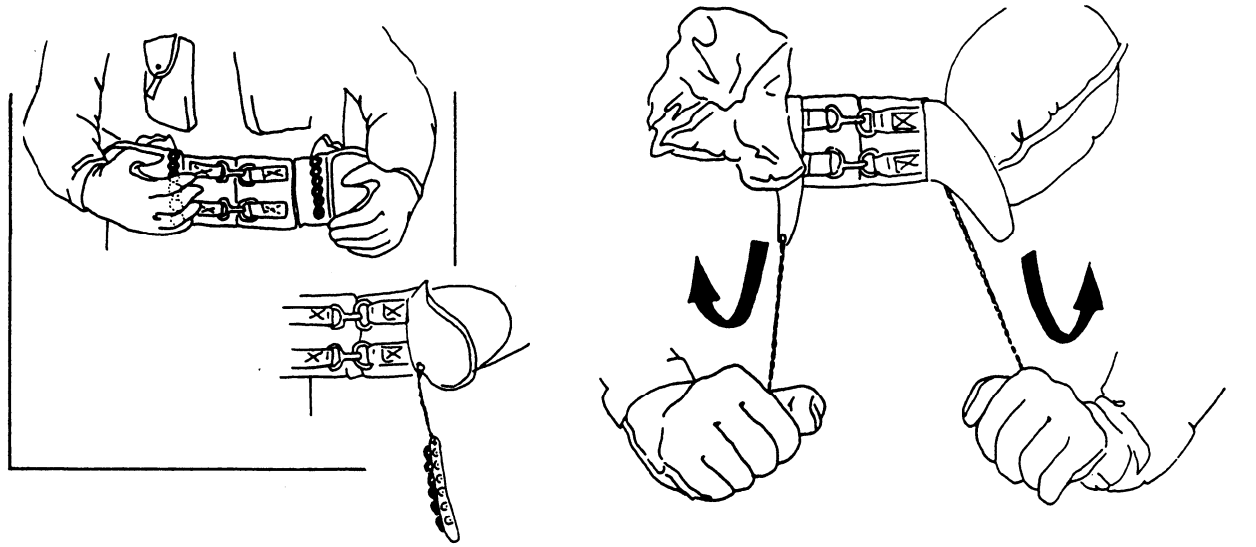

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Figure 5-12.—LPA inflation.

Leaving Aircraft.— Grasp the door edges about waist high, and place your feet together over the edge of the hatch, as shown in figure 5-10. Pull your body forward and exit the aircraft.

The NB-8 parachute used in the P-3 aircraft does not have automatic opening features. Therefore, the aircrewman must manually pull the rip cord. Grip the rip cord handle as shown in figure 5-11 and pull it to the maximum length of travel. This allows for complete release of pins from the parachute pack.

Parachute Descent.— Immediately following the opening shock of the parachute, check the condition of the parachute canopy. Assuming you have a fully deployed canopy, locate the two beaded handles on the LPA; pull them down and straight out to inflate the life preserver (fig. 5-12). You may need to squeeze the waist lobes to release the hook-and-pile tapes on the collar lobes. Sometimes it is necessary to manually release the hook-and-pile tapes to allow full inflation of the collar lobes (fig. 5-13). At this point you should raise the visor on your helmet if you are over water and lower it if you are over land.

Four-Line Release.— Actuation of the four-line release system reduces oscillation and provides a method of maneuvering the parachute to an optimal landing site.

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Figure 5-13.—Aircrewman releasing the hook-and-pile tapes on collar.

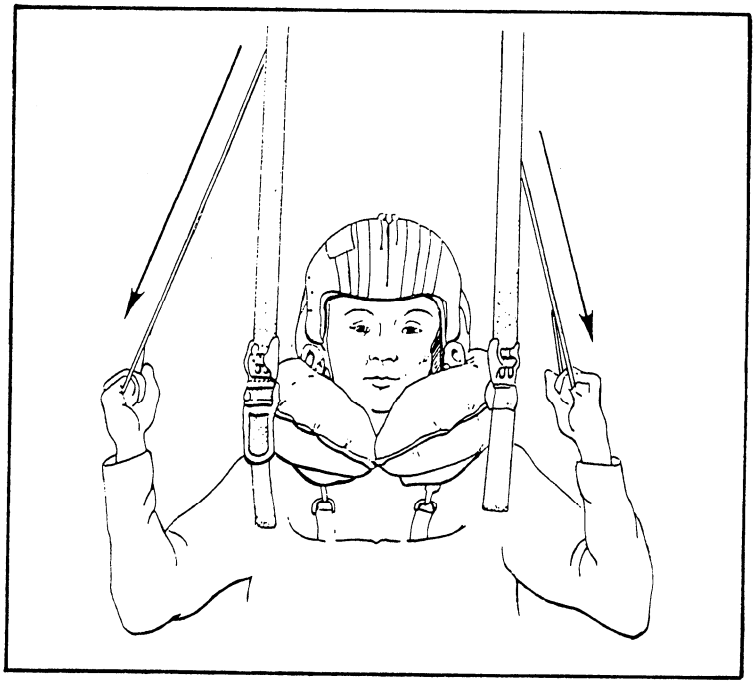

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Figure 5-14.—Aircrewman pulling lanyard loops.

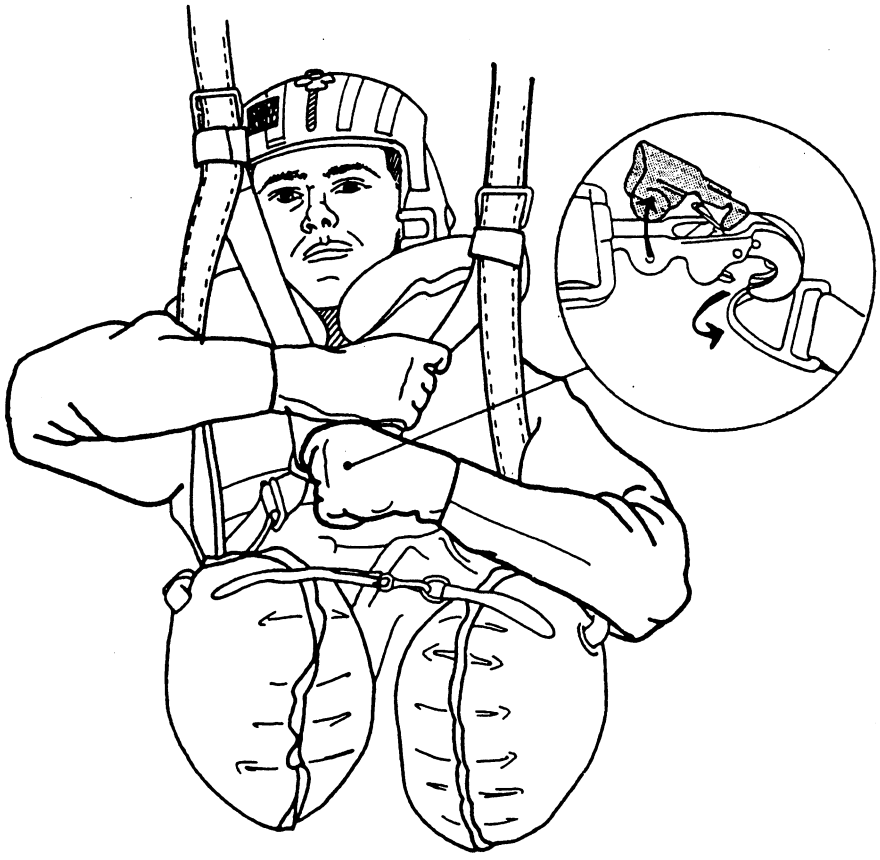

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Figure 5-15.—Aircrewman grasping left main sling webbing with right hand.

WARNING

Carefully inspect the canopy and suspension lines prior to using the four-line release. If any parachute damage is evident or if there are broken suspension lines, do NOT use the four-line release system.

The four-line release system should not be used at night since parachute damage may be difficult to determine.

To operate the four-line release system, you locate the two lanyard pull loops. They are on the inside of the rear risers. Pull the lanyard pull loops sharply downward (fig 5-14). This takes approximately 20 pounds of pull force. This action frees the rear four suspension lines, which allows the canopy to form a lobe in the rear center and permits a steady escape of air, which reduces oscillation and allows directional control. By pulling down on the right lanyard, you steer your canopy to the right. To steer your canopy to the left, you pull down on the left lanyard.

Parachuting. — Try to determine the wind direction at the surface by watching white caps or smoke from the aircraft wreckage or known surface winds in the vicinity. Winds at the surface may be quite different from those encountered at altitude. When nearing the water, maneuver the parachute so that you are facing into the wind. Begin preparing for water entry as soon as possible after your chute is opened, because judging your altitude over water is difficult in daylight and nearly impossible at night. Grasp the left main sling webbing with your right hand (fig. 5-15). With your left hand, release the chest strap and left leg strap quick-ejector snap (fig. 5-16). Now grasp the right main sling webbing with your left hand. With your right hand, locate the right leg strap quick-ejector snap and release it upon water entry (fig. 5-17). Your

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Figure 5-16.—Aircrewman releasing left leg strap quick-ejector snap.

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Figure 5-17.—Aircrewman releasing right leg strap quick-ejector snap.

buttocks must be well back into the harness seat at all times. After you have entered the water release your parachute harness and get out of it; in the water the parachute can quickly become your worst enemy. It can easily drag you under and cause you to drown; therefore, it is important for you to get out of your harness as quickly as possible.

To remove the harness, place your right hand between your body and the right main sling (fig. 5-18); turn 90 degrees to the left and roll out of the harness (fig. 5-19).

A fact that may not be obvious is that when you bail out of any aircraft equipped with multiplace life rafts, such as the P-3, you will not have a life raft available when you reach the surface. Even if the life rafts are jettisoned before bailout, your chance of landing close to one is very remote; therefore, you will have to depend entirely on your life preserver for flotation.

Life Rafts

Naval aircraft are required to carry enough life rafts to meet the needs of the aircrewmen in the event of a crash landing at sea. Some aircraft carry the LR-1, a one-man life raft designed to be carried in a soft pack or a seat survival kit (SKU and RSSK), and the helo backpack.

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Figure 5-18.—Aircrewman placing right hand between body and right main sling.

The Navy maintains four sizes of multiplace life rafts—the LRU-12, 13, 14, and 15. These life rafts are installed in aircraft that have the capability of carrying a large crew or a large number of passengers. To select the proper life raft for an aircraft, refer to the *Allowance List, NAVAIR* 00-35QH-2. There is also a listing by aircraft in the *Inflatable Survival Equipment Manual,* NAVAIR 13-1-6.1. The Navy also uses some aircraft that are civilian-contractor maintained,

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Figure 5-19.—Aircrewman turning 90 degrees.

such as the C-9, C-12, and C-44. These aircraft carry life rafts that vary in capacity from 7 to 25 persons.

Three basic designs of life rafts used in naval aircraft are shown in figures 5-20, 5-21, and 5-22.

LR-1 LIFE RAFT ASSEMBLY.— The LR-1 assembly (fig. 5-20) consists of a one-man life raft and an inflation assembly (CO_2 cylinder with inflation valve). The life raft has a single flotation tube with a noninflatable floor. It is 6 feet long when fully deployed. It is blue and features a weather shield, a sea anchor, a sea anchor pocket, and ballast bags with a retaining line and pocket.

- The weather shield is sea blue on the outside and fluorescent red on the inside. It is sewn to coated cloth tape, which is cemented around the periphery of the life raft. When the securing straps (which are manufactured from hook-and-pile tape) are properly positioned, the hooks interweave with the pile to hold the weather shield in a stowed condition.

- The sea anchor is attached to one end of the lanyard and is stowed in a pocket outboard of the flotation tube. The other end of the lanyard is attached to a ring located at the bow end of the raft.

Inflation Procedures.— There are two inflation systems for the LR-1 life raft. The CO_2, a mechanical system, inflates the raft within 30 seconds and is normally used during parachute descent. If the mechanical system fails, the oral inflation system is used to inflate the raft. The oral inflation system consists of a length of rubber tubing; an oral inflation valve with a rubber mouthpiece; and a knurled, locking collar. The oral inflation valve may be used in topping or relieving pressure from the flotation tube; this may become necessary because of temperature changes from daytime to nighttime. The raft should not be inflated drum tight, as it will ride more comfortably in choppy seas if the pressure is slackened.

Righting Procedures.— The LR-1 life raft is equipped with boarding handles to assist the survivor in boarding the life raft. You can easily right the LR-1 life raft by grasping the boarding handles on the flotation tube and turning it over.

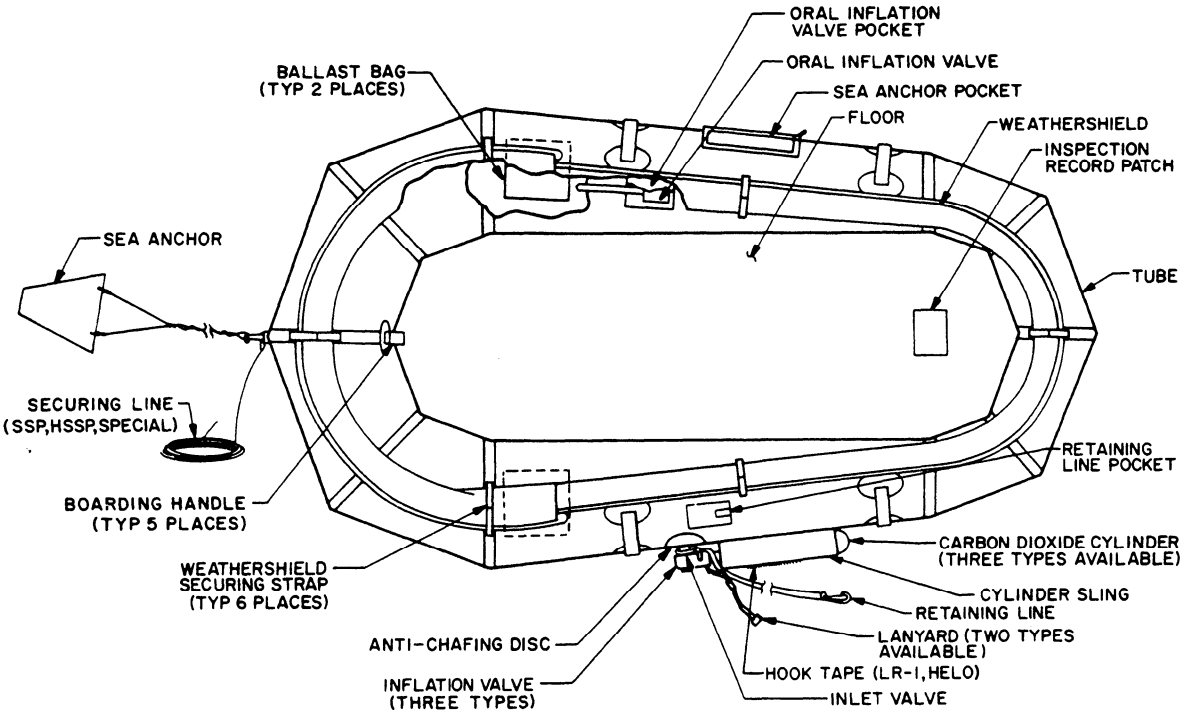

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Figure 5-20.—LR-1 life raft assembly parts nomenclature.

Boarding Procedures.— The design of the LR-1 life raft makes it easy to board. Approach the life raft from the small end. One end is noticeably smaller than the other. Grasp the small end of the flotation tube with both hands. Locate the boarding handles and push the life raft down into the water. To board the raft, pull your body into the raft so that the upper body is completely inside. Once you are inside the raft, roll your body so that you are lying face up or in a sitting position. Now deploy the sea anchor. The sea anchor reduces drifting. Adjust the length of the sea anchor securing line so that the sea anchor rests in the wave trough and causes the life raft to ride on the crest of the wave. Always remain attached to the raft; if it capsizes in rough water or during high winds, it will be lost if not securely fastened to you.

LRU-12/A LIFE RAFT ASSEMBLY.— The LRU-12/A, 13/A, and 14/A are very similar in design. The basic difference is size. The LRU-12/A carries 4 survivors, the LRU-13/A carries 7, and the LRU-14/A carries 12. Of the three, only the LRU-12/A life raft is discussed in this chapter.

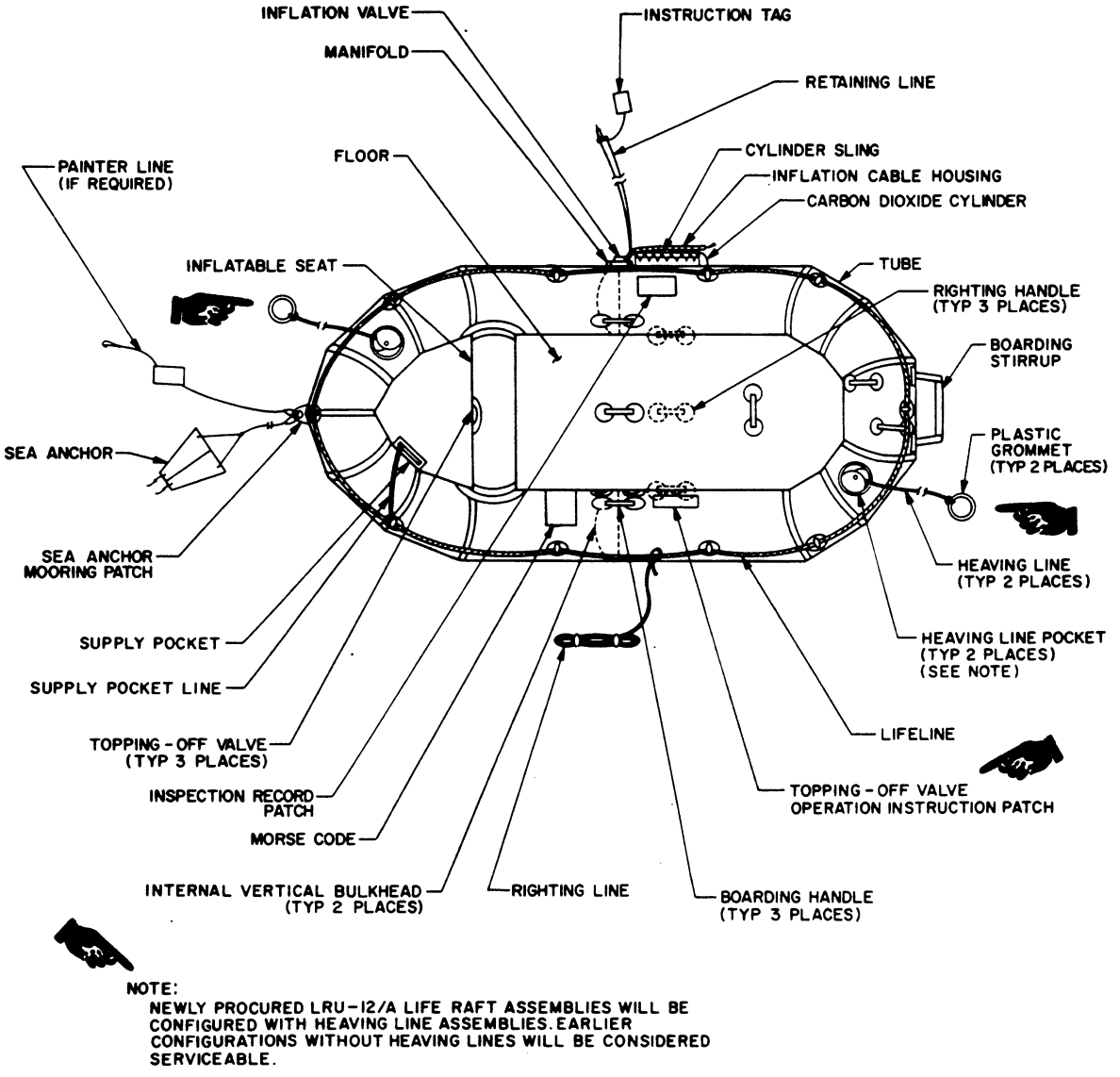

Figure 5-21.—LRU-12/A life raft assembly parts nomenclature.

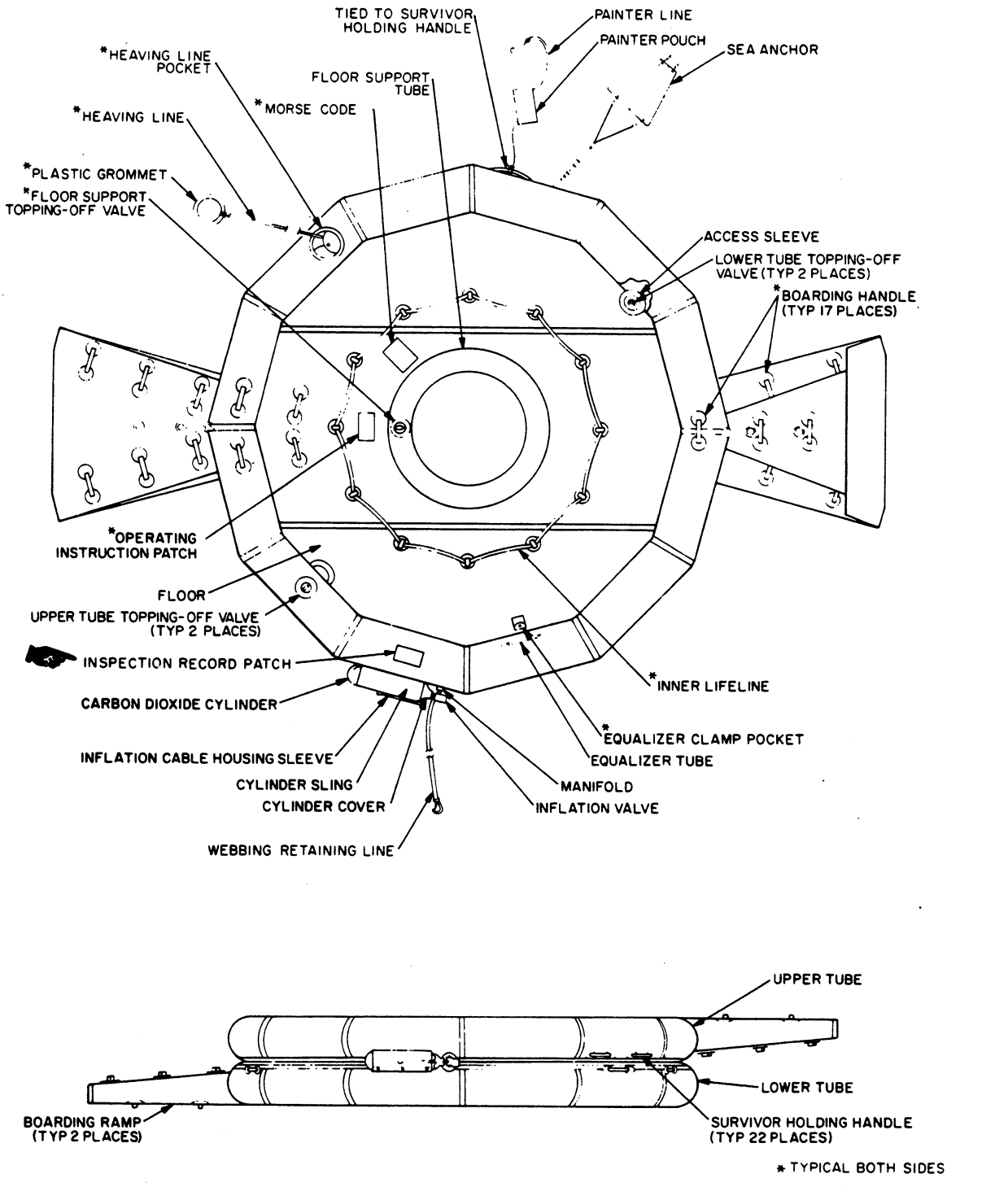

Figure 5-22.—LRU-15/A life raft assembly parts nomenclature.

The LRU-12/A life raft assembly (fig. 5-21) consists of a four-man inflatable life raft and an inflation assembly (a CO_2 cylinder with an inflation valve and a manifold). The life raft has an orange flotation tube that is divided into two separate compartments by two internal vertical bulkheads. These two compartments are called the bow and the stern. The raft has a noninflatable floor with an inflatable seat in the bow section. This seat is manually inflated through the topping-off valve using the hand pump. A lifeline encircles the flotation tube. A righting line and accessory-container securing line are attached to the lifeline. Survival equipment is stowed in the accessory container and a supply pocket attached to the flotation tube. A sea anchor is attached to the bow, a boarding stirrup is attached to the stern, and heaving lines equipped with rubber weights are attached at each end. Two topping-off valves and four boarding handles are located on the tube. Three righting handles are located on the underside of the life raft floor. Two boarding handles are located on the topside of the floor, one amidships in the center, the other athwartships towards the stern. The life raft CO_2 inflation assembly and accessory container are contained in the LRU-12/A carrying case. When the life raft is fully inflated, it measures 9 1/4 feet long.

Inflation Procedures.— Like other flotation equipment, the LRU-12/A has a CO_2 type of inflation system. This system can be installed to operate automatically or manually, depending upon aircraft installation.

The LRU-12/A is also equipped with a hand pump for manually inflating the two-section flotation tube and/or the inflatable seat and is stowed in the accessory container. The pump-attaching fitting and the topping-off valve are designed to allow a positive connection. To use the hand pump, follow the steps listed below:

NOTE: In the absence of a CO_2 type of inflation system, manual inflation starts with the seat section. It fills quickly and provides flotation for the raft while the main flotation tubes are being inflated.

● Screw the inflation end of the assembly hose of the hand pump into the topping-off valve (fig. 5-23).

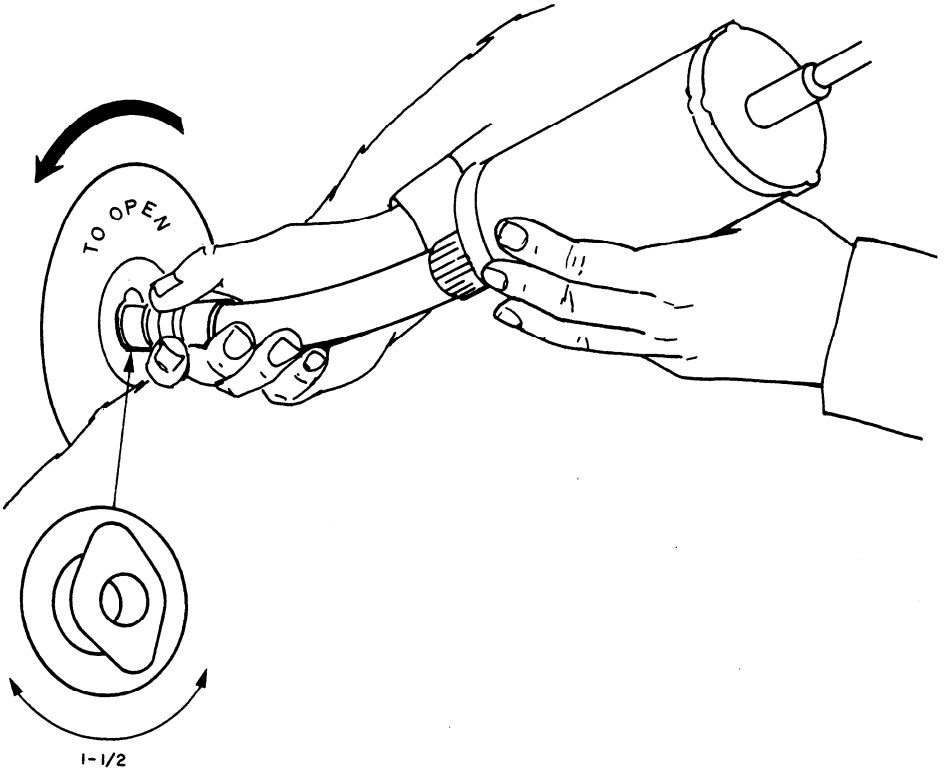

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Figure 5-23.—Survivor holding the hand pump while attaching the assembly hose to the topping-off valve.

● Turn the topping-off valve cap 1 1/2 turns to the right when the assembly hose is attached.

● Pump the handle until desired inflation is achieved.

● Then turn the valve cap 1 1/2 turns to the left.

● Remove the hand pump and secure it in the accessory container.

NOTE: The main flotation tube is divided into two separate sections by an internal bulkhead. This design feature prevents the life raft from completely deflating if for some reason the tube is punctured.

Righting Procedures.— The LRU-12/A life raft may inflate upside down. To correct this problem proceed as follows:

1. Locate the righting line on the side of the raft opposite the CO_2 bottle.
2. Toss it over the life raft on the side where the CO_2 bottle is located.
3. Grasp the righting line and climb onto the bottom of the raft. Pull the righting line from the far side and at the same time stand up and push the near side of the life raft away with your feet. This will cause the life raft to flip over.

Boarding Procedures.— In most cases, there are four or more survivors in the water. Upon reaching the life raft, grasp the lifeline to keep the raft from drifting away until your turn to board. Use the boarding stirrup and the boarding handles at the stem to board the life raft; survivors should board one at a time.

The first survivor to board the life raft should assist the remaining survivors and ensure the life raft loading is balanced to protect against overturning.

LRU-15/A LIFE RAFT ASSEMBLY.— The LRU-15/A life raft assembly (fig. 5-23) consists of a 20-man life raft and an inflation assembly (CO_2 cylinder with an inflation valve). The raft is orange and has two single compartments, circular flotation tubes connected by an equalizer tube, a noninflatable floor suspended between the two flotation tubes, and two boarding ramps. One ramp is attached to each tube on opposite sides of the raft. The floor has an inflatable floor support. The life raft also features a sea anchor, a lifeline, boarding handles, and topping-off valves located on each side of the flotation tubes and floor support. The life raft and accessory container are contained in the LRU-15/A carrying case. The life raft assembly is stowed either in an accessible area inside the fuselage (droppable type) or in a life raft compartment (wing or fuselage installation) of the aircraft.

Inflation Procedures.— The wing-installed LRU-15/A life raft assembly is automatically ejected and inflated from the life raft compartment of the aircraft when the compartment door is released. To inflate the droppable LRU-15/A life raft, you perform the following steps:

● Locate the inflation assembly actuating handle outside the end flap of the carrying case.

● Pull the actuating handle with sufficient force to actuate the inflation assembly. Ensure that adequate space is provided for the raft to inflate.

NOTE: This is a very large life raft and should never be inflated inside an aircraft.

Righting Procedures.— Because of the large size and cumbersome configuration of the LRU-15/A life raft, it is designed with identical components on each side so that the raft is always right side up.

Boarding Procedures.— Survivors should board the LRU-15/A using the boarding ramps on the lower flotation tube (boarding is possible over the ramp attached to the upper tube but is extremely difficult and therefore not recommended). As you board the life raft, grasp the handles provided and kick with your feet to pull yourself into the life raft. Boarding can be accomplished more easily and quickly if survivors are assisted by those who board first.

The first person in the life raft is responsible for installing the equalizer clamp. The clamp is in a pocket located next to the equalizer tube. The equalizer clamp is necessary to prevent the life raft from completely deflating in the event one side of the life raft has a tear or puncture.

RAFTSMANSHIP.— We assume that with all the advanced rescue equipment and technology available to the Navy, a rescue can be effected in a few hours. However, the possibility exists that you may spend days or even weeks at sea.

Common sense is the best survival tool you will have aboard the life raft. The following dos and don'ts will help you survive in a life raft at sea.

Dos.— The following are helpful things to do while you are trying to survive in a life raft at sea:

- Stow all sharp objects and equipment that might abrade or puncture the raft fabric.

- Ensure all survival equipment is tied to the life raft. This prevents loss if any item is dropped over the side.

- Secure yourself and other survivors to the raft, in case it capsizes. Rough water or a strong wind can easily separate a raft from a survivor.

- Ration all food and water. Rationing should be based on the minimum amount of food and water that will sustain life.

- Inventory all supplies daily.

- Take every precaution to prevent the life raft from turning over.

- Sit low in the life raft and distribute the weight to hold the weather side down.

- If there is more than one life raft, tie them together. When tieing life rafts together, you should tie the first life raft at the stern and the second one to the bow. Since the LRU-15/A has no bow or stem, tie them together at any available point. If there are more than two LRU-15/A life rafts, the ties should be 180 degrees apart on the center raft.

- Allow approximately 25 feet of line between the life rafts; adjust the length of the line to correspond with the state of the sea.

- Adjust the sea anchor line so that the sea anchor will stay in the trough when the raft is at the crest of a wave.

- In very rough weather, keep a spare sea anchor rigged and ready for instant use in case the one that is deployed breaks loose. A spare sea anchor will have to be improvised as no spare is furnished; however, a paulin, casualty blanket, or signal panel can be used for this purpose.

- Be prepared to catch any rainfall, because water is essential to survival at sea.

Don'ts. — The following are some things that you should not do while trying to survive in a life raft at sea:

- Never eat any food unless an adequate amount of freshwater is available. The reason is that digestion depletes the body's fluid level. A person in relatively good physical condition can survive only about 6 days without water but can survive up to 40 days without food.

- Never drink seawater; it will cause nausea and vomiting, which further depletes the body's water level, and will eventually cause death. Seawater will not quench your thirst; it will increase your thirst.

- When fishing never tie your fishing line to the side of the life raft. A large fish can capsize your life raft.

- Never tie your fish catch to the life raft. You are inviting a larger fish to a meal.

- When you are using the Mk 13 day/night distress signal, never hold it near your life raft. The burning material will drip and can burn a hole in the flotation tube or the floor of the life raft.

- Avoid unnecessary moving around inside the life raft.

These are just a few dos and don'ts. By using common sense you will be able to add to this list.

Rafting Ashore.— Going ashore in a strong surf is dangerous. Take your time. Select the landing point carefully. Try not to land when the sun is low and straight in front of you. Try to land on the lee side of an island or on a point of land. Keep your eyes open for gaps in the surf line and head for them. Avoid coral reefs and rocky cliffs. Coral reefs do not occur near the mouths of freshwater streams. Avoid rip currents or strong tidal currents, which may carry you far out to sea. Either signal shore for help or sail around and look for a sloping beach where the surf is gentle.

If you must go through surf to reach shore, keep your clothes and shoes on to avoid severe cuts. Adjust and inflate your life vest. Trail

the sea anchor over the stern using all the available line. This will keep the life raft pointed toward the shore and prevent the sea from throwing the stern around and capsizing the life raft. Surf may be irregular and velocity may vary, so the procedure must be modified as conditions demand.

If you have a choice, do not land at night. If you have reason to believe that the shore is inhabited, lie away from the beach and signal; then wait for the inhabitants to come out and bring you in.

RESCUE DEVICES AND PROCEDURES

Rescue operations will normally be accomplished by helicopter and involve either maritime (sea) or land conditions. In this chapter we will cover only maritime rescue.

Potential survivors should be aware that, in most cases, the helicopter will first mark the location of the survivor. The pilot will fly the helicopter directly over the survivor and then fly it away from the survivor's position. At this time one to three marine markers (flares) or electric sea marker lights will be dropped prior to the start of the rescue pattern. The survivor should take caution not to touch the markers, as they can be dangerous.

A naval helicopter assigned to operate as a rescue vehicle over water will have a rescue swimmer as a crewman. When the rescue swimmer is deployed, the survivor should remain

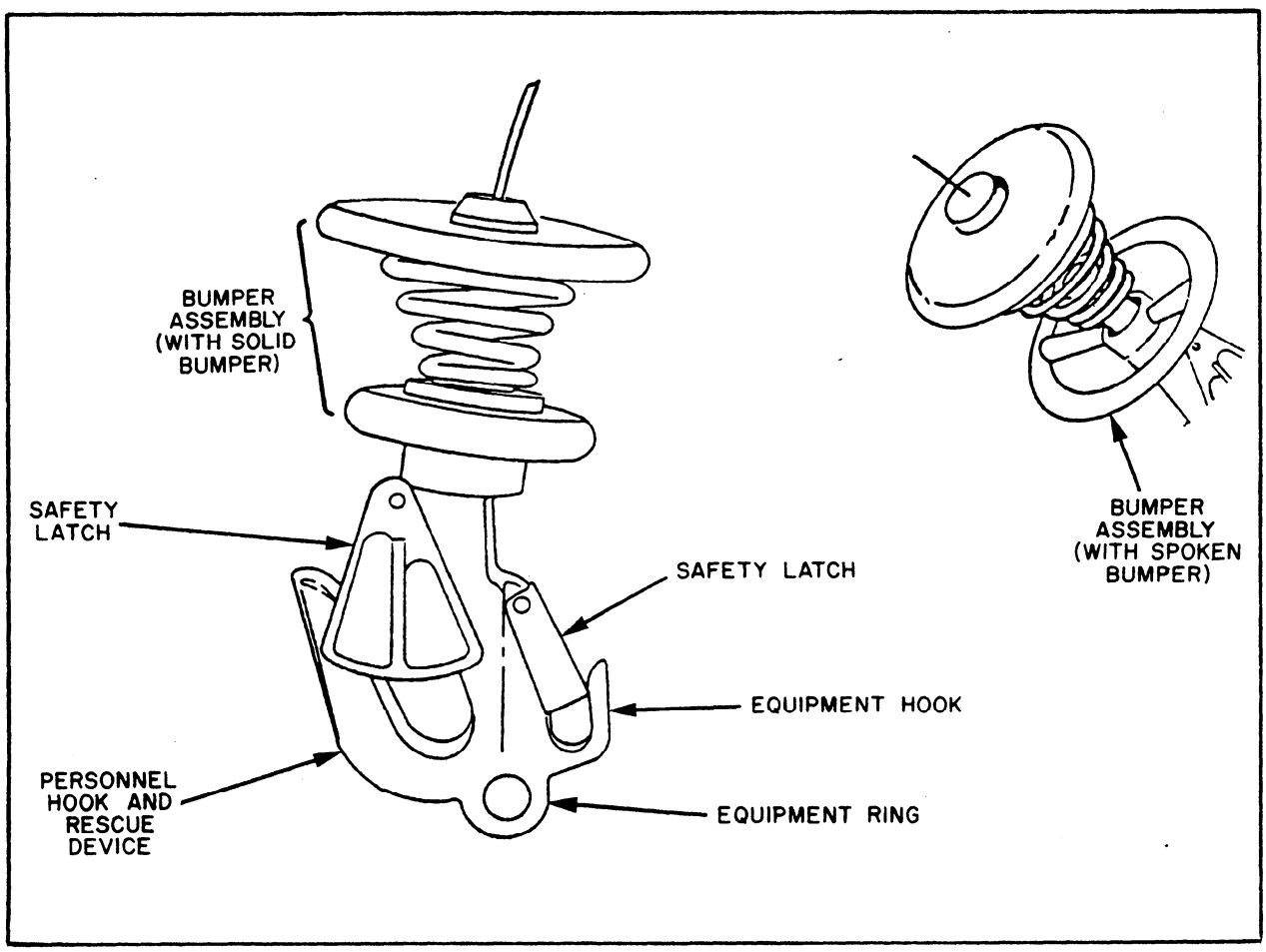

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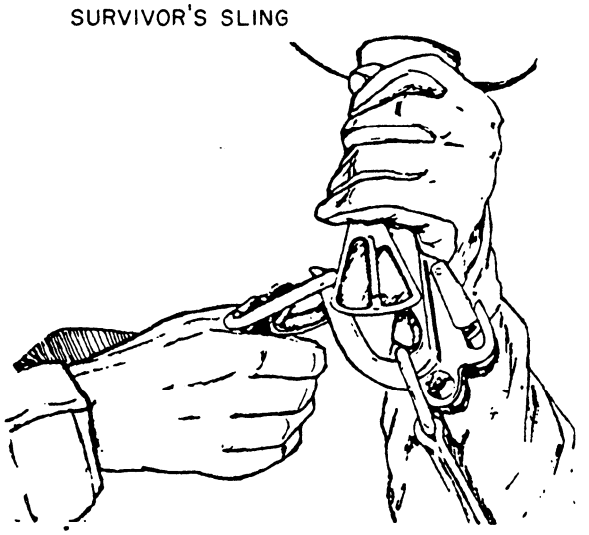
Figure 5-24.—Rescue hook.



240.133

Figure 5-25.—Attaching the rescue hook to the gated D-ring.

in the life raft and await instruction from the swimmer.

The aviator and the aircrewman must be familiar with a number of rescue devices to ensure a successful rescue. These devices are covered in the *Aircrew Survival Equipmentman* 3 & 2, volume 1, NAVEDTRA 10328. In this chapter we will discuss the use of the various rescue devices.

In each case when a Navy helicopter is the rescue vehicle, the Navy rescue swimmer will be employed to effect the rescue. Follow the swimmer's instructions and do not assist his efforts unless directed by him to do so. Because other SAR forces may not employ a rescue swimmer to assist survivors, this text will explain procedures for assisted and unassisted rescue using the following rescue devices.

Rescue Hook

The rescue hook is the primary rescue device (fig. 5-24). All other rescue devices can only be used with the double rescue hook. In accordance with *Aviation Crew Systems Rescue and Survival Equipment,* NAVAIR 13-1-6.5, the large hook, rated at 3000 pounds, shall be the only hook used to hoist personnel; the small hook, rated at 1000 pounds, is to be used only for lightweight items such as mail. The equipment ring, rated at 1000 pounds, can be used to hoist light equipment and mail.

Hoisting personnel by the equipment ring or small hook can lead to failure of the ring or hook and can result in injury or death of hoisted personnel.

When wet and cold, an individual may have difficulty handling the latch on the rescue hook. However, by pushing down on the latch with the gated D-ring, you will force the latch open on either the hook or the gated D-ring (fig. 5-25).

Rescue Swimmer's Harness

During swimmer-assisted rescues, the swimmer's harness may be used to attach the survivor to the hoist cable. When the rescue swimmer's harness is selected as the rescue lifting device, the rescue swimmer uses the following procedure:

1. He approaches the survivor from the rear and pulls the chest strap from the pocket of the rescue harness.

NOTE: When connecting to a survivor who has an SV-2 vest, he ensures that the chest strap on the survivor is loosened slightly to avoid injury. If the survivor is wearing an integrated torso harness, he uses extreme caution to ensure that the gated D-rings are not disconnected before hoisting.

2. Connects the gated D-ring of the rescue swimmers harness to the survivors lifting device. The connection of the survivor's lifting device to the rescue hook will negate the survivor's quick release feature of the swimmer's harness.

3. Signals the aircraft "ready for pickup." When the rescue hook is lowered in the water, connects the lifting V-ring of the rescue swimmer's harness to the large rescue hook.

4. Signals the aircraft "ready for hoist."

NOTE: If the survivor is wearing an integrated torso harness, the swimmer ensures that the gated D-rings are not disconnected before hoisting. Upon reaching the aircraft door opening and while bringing in the survivor, he ensures that the gated D-rings do not twist and inadvertently disconnect.

5. Upon clearing the water, he places his arms and legs around the survivor.

6. The rescue swimmer and survivor are hoisted up to the helicopter. After reaching the helicopter, the rescue swimmer assists the survivor into the helicopter.

Rescue Strop (Unassisted Rescue)

The rescue strop (sometimes called the horse collar or rescue sling) (fig. 5-26) is lowered attached to the rescue hook. The following is a step-by-step procedure for the survivor to don the strop and attach the rescue hoist:

1. Stand by as the rescue device is lowered.

WARNING

Do not touch the rescue device until after the hook makes contact with the water. This prevents any electrical shock that may occur because of static electricity buildup in the rescue device.

2. Swim to the rescue device. Grasp the free end of the rescue strop with your right hand and rotate your body clockwise, as shown in figure 5-27, until the rescue strop is wrapped around your body.

3. Attach the V-ring on the strop to the rescue hook, as shown in figure 5-28.

4. Grasp the two pull tabs of the retainer straps (fig. 5-29) and pull the straps out. Attach the quick-ejector snap hook to the V-ring and pull the strop tightly across your chest.

5. Ensure that the rescue strop is above the LPA/LPU waist lobes and high on your back. Give a thumbs-up signal to the hoist operator. Wrap your arms around the collar and keep your head down.

6. Upon clearing the water, cross your feet as shown in figure 5-30 and remain in this position until you are inside the helicopter.

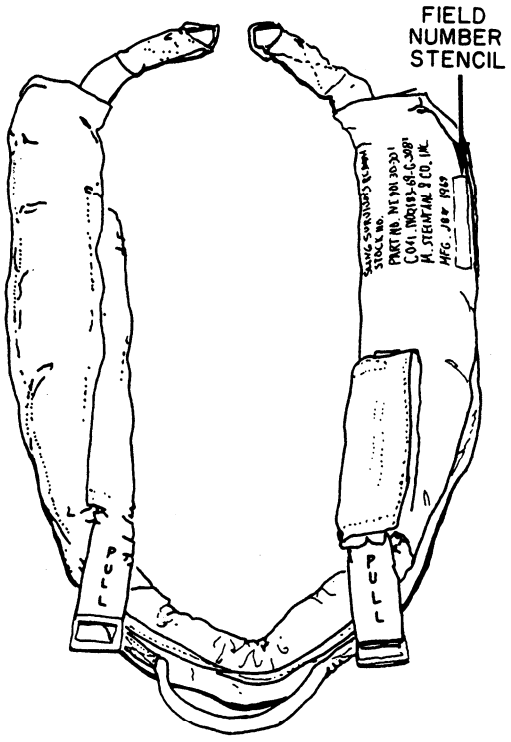


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Figure 5-26.—Rescue strop (horse collar).

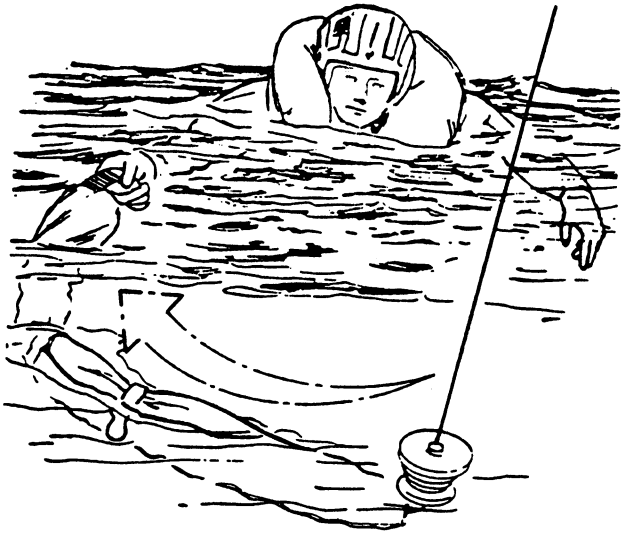

Figure 5-27.—Grasping the rescue strop.

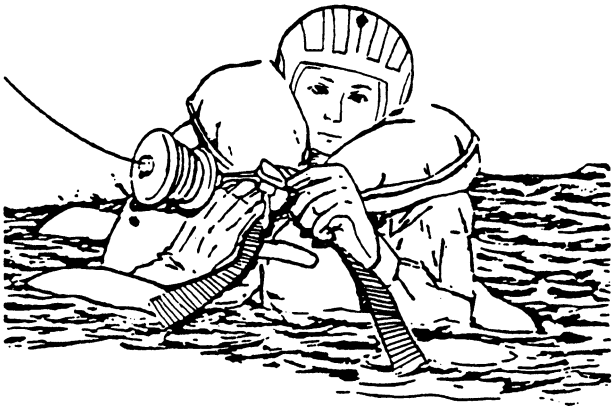

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Figure 5-28.—Attacbing the V-ring.

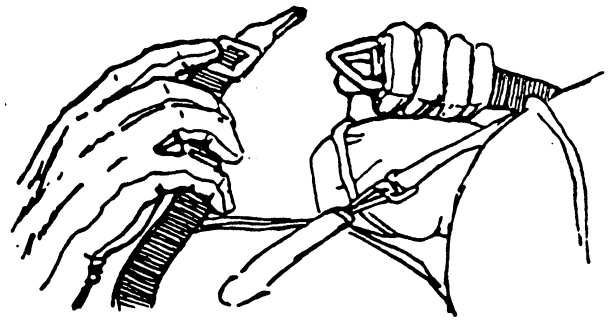

Figure 5-29.—Removing the pull tabs.

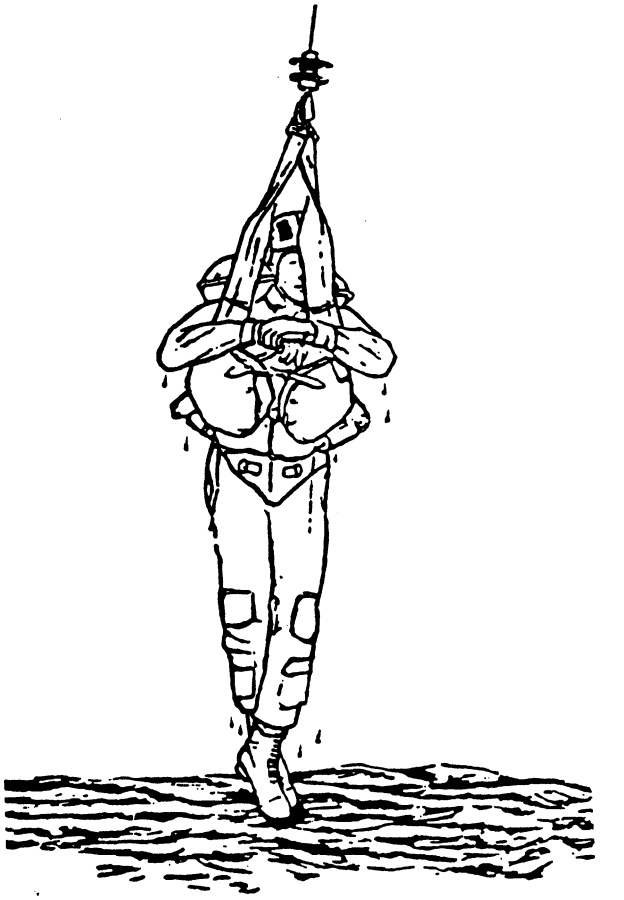

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Figure 5-30.—Hoisting the survivor's sling.

NOTE: Do not, under any circumstances, attempt to assist with your entry into the helicopter.

RESCUE STROP (Horse Collar) (Swimmer-Assisted Rescue)

When the rescue strop (horse collar) is used during swimmer-assisted rescues, the rescue swimmer uses the following procedure to attach the survivor to the hoist cable:

1. From the survivor's front, passes the free end of the rescue strop under one arm, around the back, and under the other arm.
2. Reconnects the V-ring to the rescue hook.
3. Pulls both retainer straps free and connects the quick ejector of one strap to the V-ring of the other strap and pulls them tight.

● If the survivor is wearing the Imperial dry suit, the retainer straps cannot be connected because of the bulky configuration of the dry suit and SV-2A survival vest with LPA.

4. Has the survivor fold his arms across the chest.
5. Signals the aircraft "ready for hoist."
6. The rescue swimmer and the survivor are hoisted up to the helicopter. After reaching the helicopter, the rescue swimmer assists the survivor into the helicopter.

Forest Penetrator

The forest penetrator, shown in figure 5-31, is used to assist rescue personnel in both land and

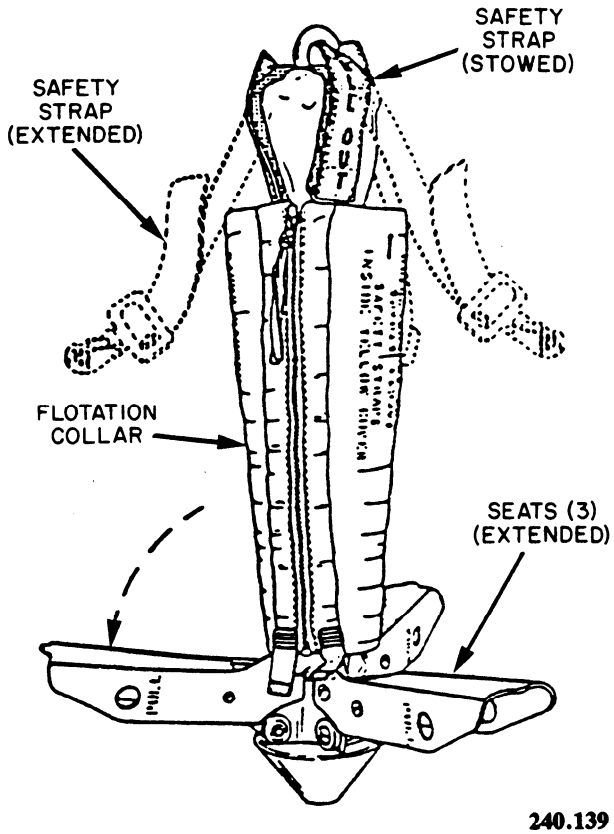

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Figure 5-31.—Forest penetrator shown with flotation collar, seats, and safety straps extended.

sea rescue operations and is designed to accommodate one, two, or three survivors at a time; however, one at a time is best for entrance into the helicopter. During land rescue, the forest penetrator is lowered to the survivor with the three seats in the retracted position; during sea rescue, it is lowered with the flotation collar installed, a safety strap hanging free, and the three seats in the retracted position. In this configuration, the penetrator will float with its top 6 inches above the surface of the water.

The following is a step-by-step procedure for the survivor to safely use the forest penetrator:

1. Lower the visor on your helmet as you wait for the rescue device to enter the water.
2. Swim to the forest penetrator and lower one of the three seats. Sit on the lowered seat facing the flotation collar.
3. Grasp the free end of the safety strap and pass it around your body. Attach the adjustable quick-ejector snap to the forest penetrator and tighten the strap as shown in figure 5-32.
4. Give a thumbs-up signal to the hoist operator. As you are lifted from the water, put your arms around the penetrator and tuck your head down.

Forest Penetrator With Flotation Collar (Swimmer-Assisted Rescue)

During swimmer-assisted rescues using the forest penetrator with flotation collar, the swimmer uses the following procedure to attach the survivor to the hoist cable:

1. After the penetrator is in the water, pulls down a seat for the survivor to sit on, facing the penetrator.
2. Disconnects a safety strap, passes it under the survivor's arm, around the back, and under the other arm. Reconnects the strap and tightens it.
3. Has the survivor wrap his arms around the penetrator.
4. Signals the aircraft "ready for hoist."
5. After the survivor is hoisted to the helicopter, the crewman assists the survivor into the helicopter.

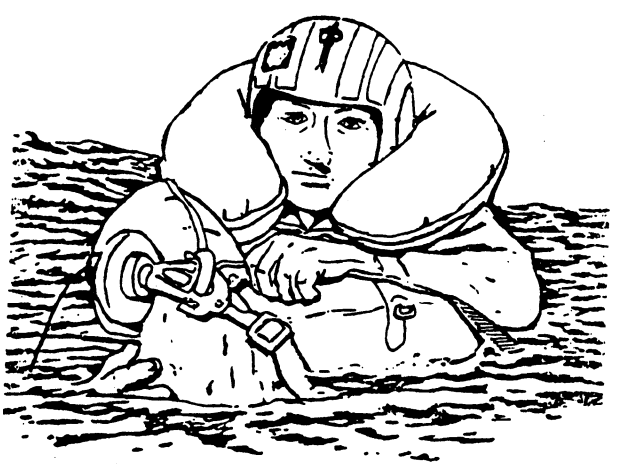

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Figure 5-32.—Attaching the forest penetrator.

Rescue Seat

The rescue seat can be used to lower and hoist personnel performing rescue operations from a helicopter over land or water. The rescue seat is designed to accommodate one survivor at a time. It is a buoyant aluminum device consisting of a hollow flotation chamber, a three-pronged seat, and a safety strap (fig. 5-33).

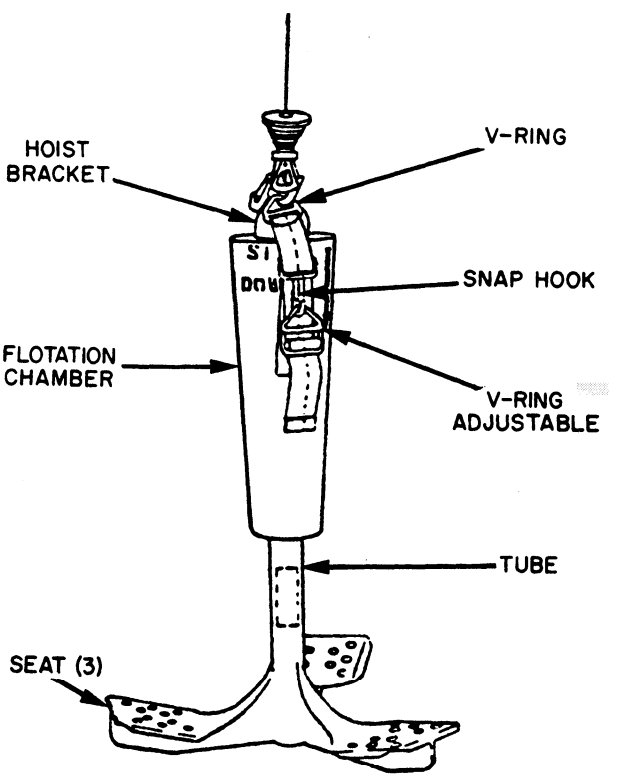

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Figure 5-33.—Rescue seat.

The rescue seat is an optional rescue device and is not normally carried by all rescue-capable helicopters. However, it is a suitable substitute for the forest penetrator for some applications.

WARNING

Failure to assume proper position on rescue seat could result in serious injury if hard contact is made with aircraft during hoist operation.

ATTACHMENT PROCEDURE.— The following is an attachment sequence for the rescue seat:

1. Swim to the rescue seat. Draw it to you and position one of the three flukes of the seat between your legs.
2. Disconnect the snap hook of the safety strap from the V-ring, pull the safety strap free, pass it under your arm, around your back, and under the other arm; then reconnect the V-ring to the snap hook and tighten the strap.
3. Give a thumbs-up hand signal to the hoist operator, put your head down to the left, and wrap your arms around the rescue seat. Upon clearing the water, cross your legs as shown in figure 5-34.

RESCUE SEAT OPERATIONAL DIFFICULTIES.— Ensure that the safety strap is on and that you hold tightly to the flotation chamber. Do not lean back; it will cause the rescue seat to swing and tilt away from the rescue hook.

Rescue Seat (Swimmer-Assisted Rescue)

During swimmer-assisted rescues using the rescue seat, the swimmer uses the following procedures to attach the survivor to the hoist cable:

1. After the rescue seat is in the water, faces the flotation chamber and assists the survivor in sitting on the seat.
2. Disconnects the safety strap; passes it under one arm, around the back, under the other arm, and reconnects the V-ring to the rescue hook.
3. Tightens the strap.
4. Has the survivor wrap his arms around the flotation chamber.
5. Signals the aircraft "ready for hoist."

WARNING

The survivor must not attempt to get off the rescue seat until directed by the crewman.

6. After the survivor is hoisted to the helicopter, the crewman assists the survivor into the helicopter.

Rescue Net

The rescue net is a simple and safe rescue device that can be used to hoist two survivors into a helicopter. It is designed for multiple rescue scenarios or for rescuing survivors who are unfamiliar with other rescue devices, such as the rescue strop or rescue seat. A lifting ring for hoisting is located at the top or upper portion of

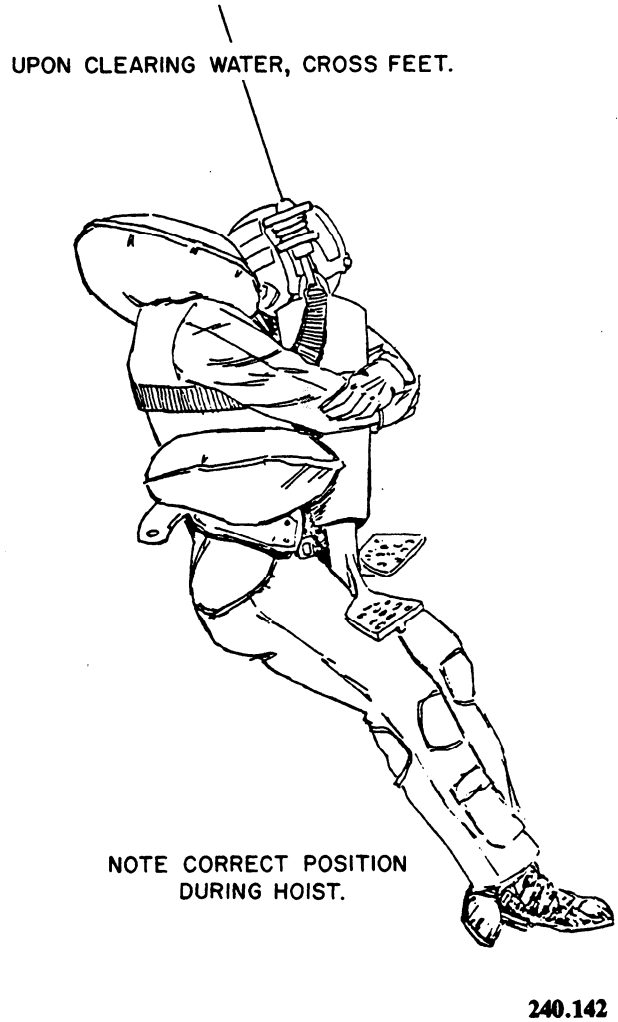

Figure 5-34.—Rescue seat maritime rescue procedure.

the net, along with locking support rods. These rods incorporate sliding sleeves to prevent the net from collapsing while it is occupied. At the front of the net are two additional support rods that can be disconnected from the top section when it is stored. When in use, the rescue net tilts away from its open side. This design helps prevent survivors from falling out (fig. 5-35).

The following is a step-by-step procedure for the survivor to safely board the rescue net:

1. When the net enters the water, swim to the net and position the net with its opening directly in front of you. Grasp each of the lower support rib floats (fig. 5-36).

2. Pull yourself into the net and turn so you are facing the opening.

3. Move all the way to the back of the net with your back resting against the rear of the net and your arms and legs completely inside. Give a thumbs-up hand signal to the hoist operator and maintain a secure handhold during the hoist.

Rescue Net (Swimmer-Assisted, Single Rescue)

During swimmer-assisted rescues using the rescue net, the swimmer uses the following procedure to assist the survivor:

1. Places the rescue net opening directly in front of the survivor without disconnecting it from the rescue hook.

2. Places the survivor in a collar/equipment tow and swims into the rescue net backwards while positioning the survivor on either side of the net, facing out.

3. Ensures the survivor is completely inside the net.

WARNING

The survivor must not attempt to get out of the rescue net until directed by the crewman.

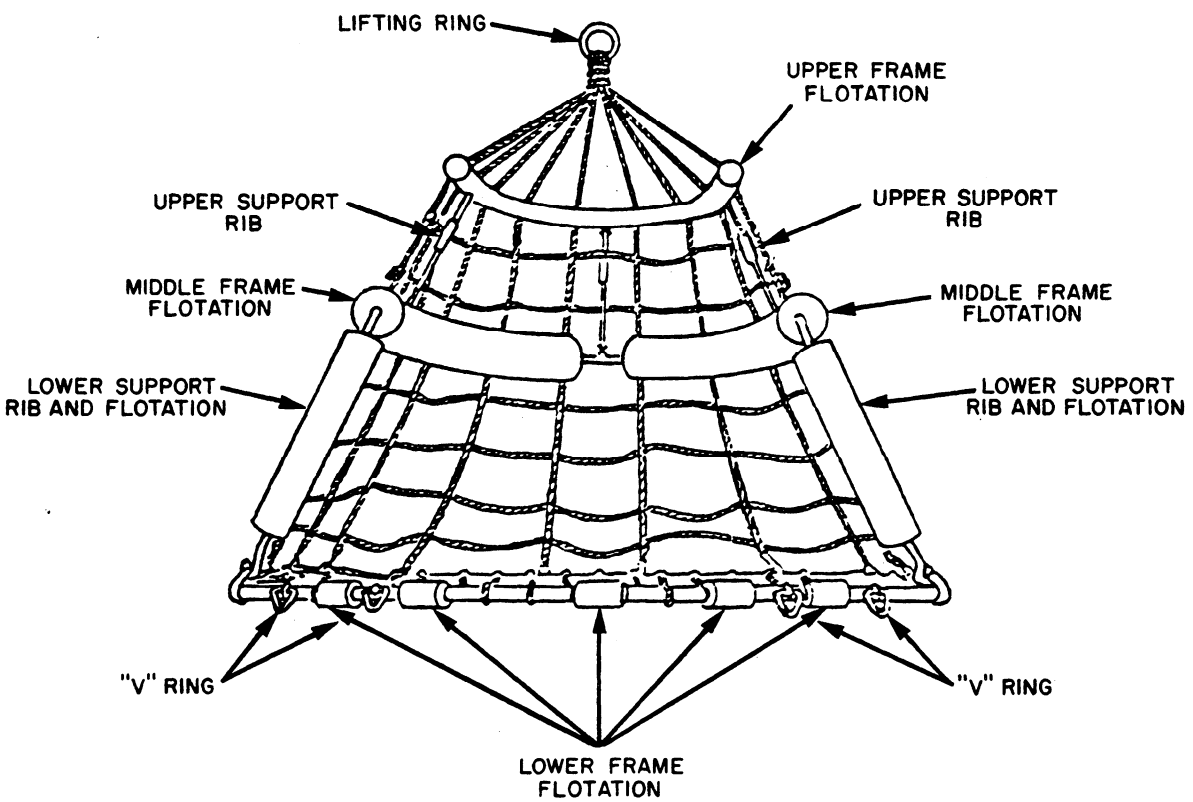

Figure 5-35.—Rescue net.

4. Places one arm across the net to ensure that the survivor cannot fall out and signals the aircraft when ready for hoisting. After reaching the helicopter, the crewman hooks up the safety strap from the rescue net to the decking of the helicopter. The crewman assists the survivor into the helicopter.

Rescue Net (Swimmer-Assisted, Multiple Rescue)

The following is a step-by-step procedure for the swimmer to-use when performing multiple rescues:

1. Places the rescue net opening directly in front of the survivors without disconnecting it from the rescue hook.
2. Has the survivors swim into the rescue net.

WARNING

The survivors must not attempt to get out of the rescue net until they are directed by the crewman.

3. Ensures that the survivors are completely in the rescue net with their legs inside. The survivors are hoisted to the helicopter. The crewman hooks up the safety strap from the rescue net to the decking of the helicopter. The crewman assists the survivors into the helicopter.

SEARCH AND RESCUE (SAR) COMMUNICATION

During rescue operations, it is essential that you use standardized communication procedures. Voice, hand, and signal communications are important in aiding a rescue. The primary means of communication is the survival radio carried by the aircrewman or supplied with the survival equipment. Instructions for using the radio are embossed on the radio case, and all crewmen must be familiar with the radio operations.

Radios

Depending upon available stock levels, air commanders may direct a particular radio to be used. If no particular type of survival radio is

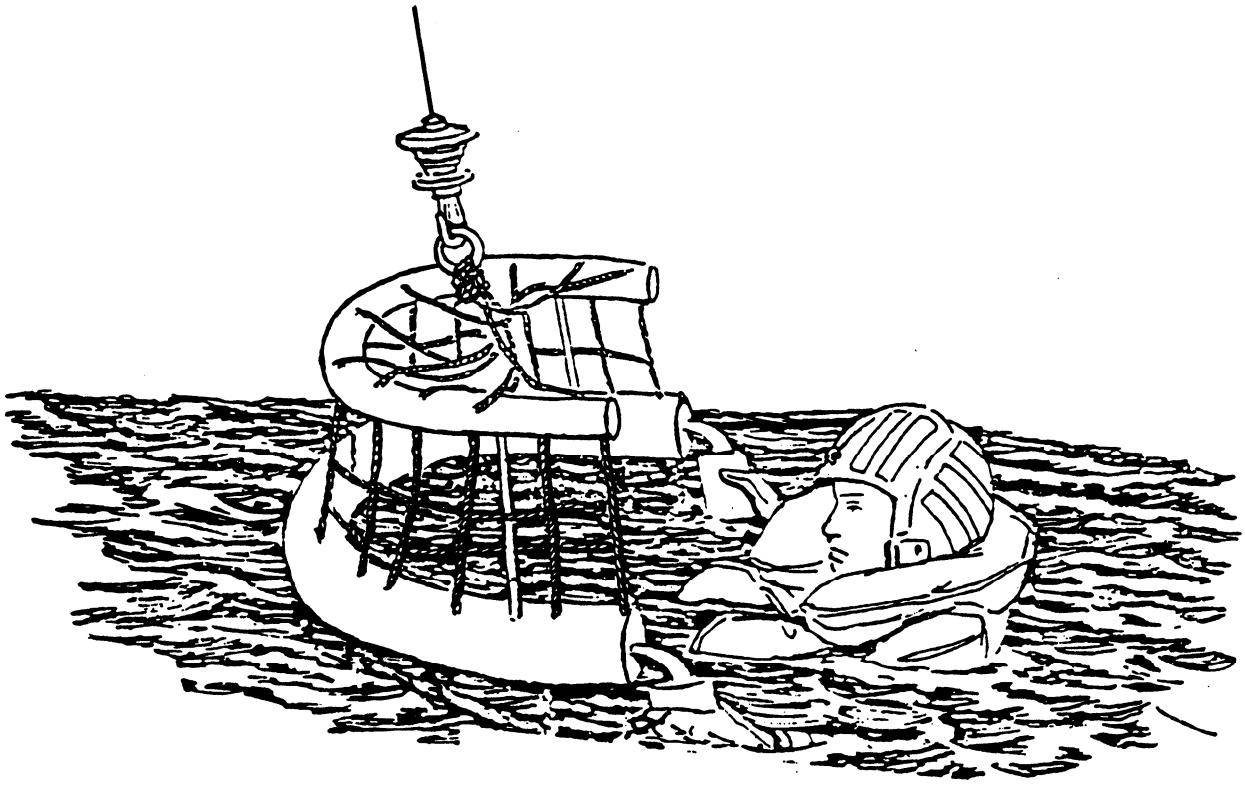

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Figure 5-36.—Survivor entering the rescue net.

available, each life raft must have an AN/URT-33A beacon or AN/PRC-90 radio set. We will cover the AN/PRT-5, AN/URT-33A, and the AN/PRC-90 survival radios in this chapter.

In addition to the automatic direction finder (ADF) capability of SAR force aircraft, the United States government also uses satellites that monitor guard frequencies for emergency locator transmitter (ELT) broadcasts.

AN/PRT-5.— The AN/PRT-5 radio transmits a tone-modulated signal in both high- and ultrahigh-frequency ranges. The set has an inflatable collar assembly that allows it to float at sea or sit upright on land. The radio can operate continuously for 72 hours at 25°C (77°F). No provisions for voice or code communications or for receiving signals from search aircraft are available with this transmitter. The AN/PRT-5 radio operates on 243.0 and 8364 MHz. The assembly instructions and the directions for use are included with each set.

AN/URT-33A.— The AN/URT-33A beacon radio is a battery-operated radio that transmits a tone-modulated radio signal. The battery provides 72 hours of continuous operation. It must be pointed out that this beacon should not be used at the same time the AN/PRC-90 is being used, as the AN/URT-33 will interfere with the voice communication signal of the AN/PRC-90. When you are using the AN/URT-33, do not point the antenna directly toward the receiving aircraft because of the type of antenna employed; a conical area perpendicular to the antenna tip does not radiate a signal.

Do not attempt to use the telescoping antenna on the AN/URT-33A radio without first detaching the flexible antenna. Use of both antennae creates interference in the transmission patterns of both.

To turn the AN/URT-33A radio on, you must move the switch to a position where the word *ON* can be read. This may be confusing to the aircrewman, and the AN/URT-33A could be on when the aircrewman thinks it's OFF.

AN/PRC-90.— The AN/PRC-90 radio set is a dual-channel personal emergency rescue transceiver, used principally for two-way-voice or modulated-continuous-wave (MCW) communication between a downed aircrew member and a rescue aircraft. Provisions are included for transmitting tone MCW and swept-frequency homing beacon signals to guide rescue efforts.

The AN/PRC-90 is battery powered and contains a flexible antenna, an interchangeable telescopic antenna, a function switch (knob and indicator), an MCW button for Morse code, a volume control dial, and an earphone.

When you are using the voice mode, the AN/PRC-90 is capable of transmitting up to 60 nautical miles (nmi) and up to 80 nmi on beacon or code. A rule of thumb is that this and other survival radios are limited to a line-of-sight

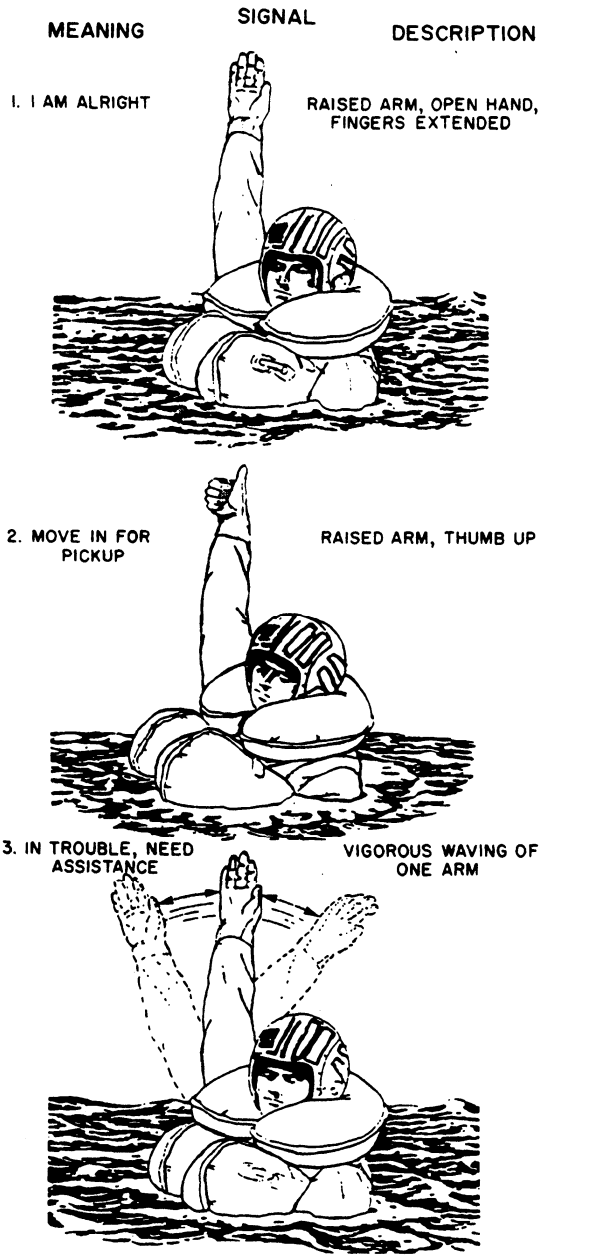

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Figure 5-37.—Rescue hand signals.

transmitting capability. Because of this line-of-sight imposition, you should try to transmit from the highest point in the area. All survival radios should be held at least 14 inches above the surface for best results. Signal range increases proportionally with the altitude of the search aircraft provided the line of sight is not obstructed. Degradation can be expected when the radio set is operated in bad weather and inside areas of rugged terrain. The radiated ranges given are obtained when the half-wave antenna is used; the range is typically one-third less when the quarter-wave antenna is used.

Hand Signals

Hand signals are used by all helicopter crewmen. All aircrew members must be thoroughly familiar with the rescue hand signals to ensure the success of the rescue attempt. All aircrewmen must memorize the hand signals shown in figures 5-37, 5-38, and 5-39.

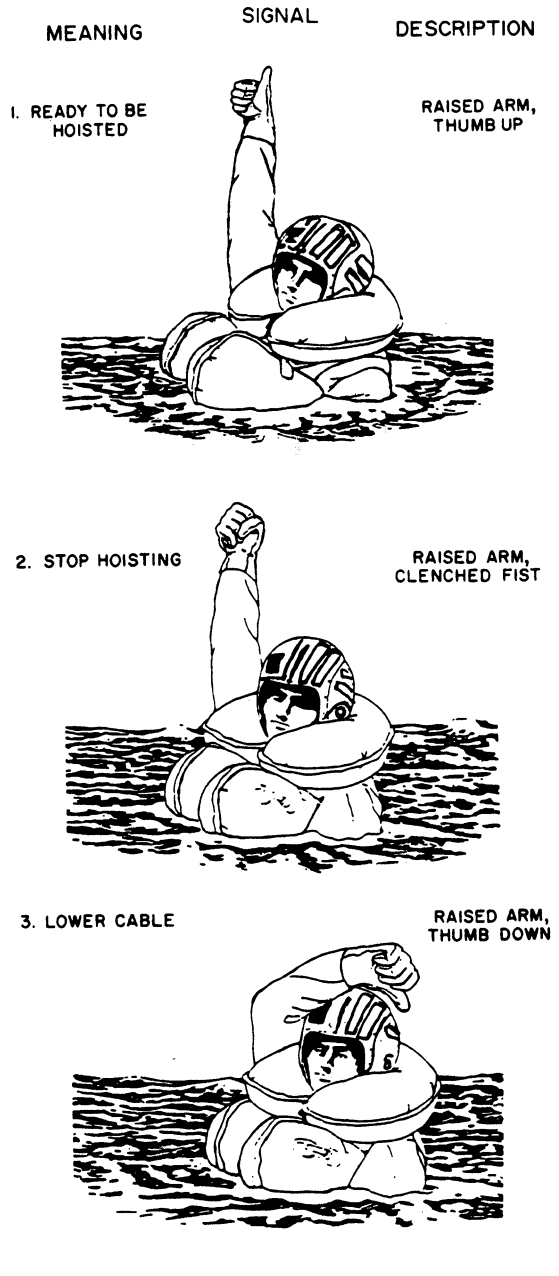

Figure 5-38.—Signals to the hoist operator after hookup to the rescue hook.

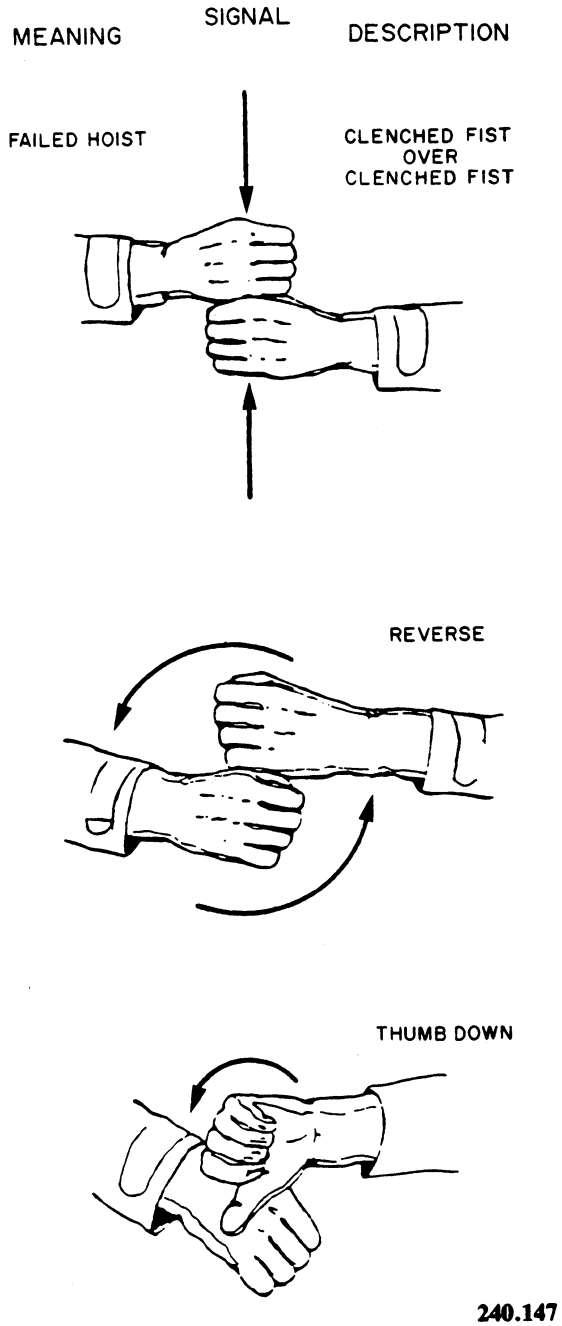

Figure 5-39.—Signals from the hoist operator after hookup to the rescue hook.

SURVIVAL

When an aircraft must bewitched or crash-landed, the sudden shifting of cargo or equipment may cause injury or loss of life. Therefore, it is important to secure any loose gear that may not be tied down and recheck cargo for security of tiedowns. Emergency gear, such as life rafts, water, food, and first-aid kits, should be placed in the aircraft where it can be easily removed in the event of a crash landing. Each type of aircraft has different ditching or crash-landing procedures. Therefore, you should refer to the NATOPS manual for ditching procedures of each specific aircraft.

LAND SURVIVAL

Once your aircraft has crash-landed, clear the aircraft as soon as possible. If you have time, remove the emergency supplies from the aircraft.

- Once the aircraft is cleared, stay a safe distance away until the engines have cooled and any spilled fuel has evaporated.

- Set up temporary shelter for protection from the wind and rain. If a fire is needed, start it at once.

- Get your emergency radio operating and have other signaling equipment, such as flares, ready for immediate use.

- Now relax and rest until you are over the shock of the crash. Leave extensive preparations and planning until later.

- After you rest, organize the camp. Appoint individuals to specific duties. Inventory all food and equipment. Look for a water supply. Prepare a shelter for protection from rain, hot sun, snow, wind, or cold. Collect all possible fuel for fires. Try to have at least a day's supply of fuel on hand. Look for food.

- Prepare signals that can be recognized from the air. Spread a parachute canopy out. This will be a good signaling aid for search aircraft.

If you have bailed out, try to make your way to the crashed aircraft. The rescuers can spot it from the air even when they cannot see a person.

Stay with the aircraft unless briefing instructions have been to the contrary. Do not leave the aircraft crash area unless you know you are within easy walking distance of help. If you travel, leave a note giving planned route (except in hostile territory). Stick to your plan so rescuers can locate you.

You are the key man in the rescue. Help the search parties to find you and follow their instructions when they sight you.

ARCTIC SURVIVAL

Most people, when they think of arctic survival, think of trying to survive on an ice float at a temperature of –50° below zero without shelter or the possibility of getting food. This is not true.

Even on the ice pack, a person who is properly prepared can survive. Many of the arctic regions have abundant plant and animal life. The arctic regions are not too different from some regions of the United States.

Shelter

In the Arctic, as in any area, a shelter can be improvised from parts of the aircraft and emergency equipment or from natural materials in the vicinity.

The kind of shelter that is made depends on whether protection is needed from rain, cold, heat, sun, or insects, and also whether the camp is only for a night or for many days.

Choose the location for the camp carefully. Try to be near fuel and water—especially water.

ARCTIC WINTER.— Do not live in the aircraft-it will be too cold. Try to improvise a better insulated shelter outdoors.

Camp in an area of timber, if possible, to be near fuel. If you cannot find timber, choose a spot protected from wind and drifting snow. Do not camp at the bases of steep slopes or cliffs where snow may drift heavily or come down in avalanches or in areas where you run the risk of floods, rockfalls, or being battered by winds.

In timbered country, a good winter shelter is a lean-to. Lay the covering boughs shingle fashion, starting from the bottom. If you have a piece of parachute nylon, use it for the roof. Close the ends with fabric or boughs.

Keep the front openings of all shelters crosswind. A windbreak of snow or ice blocks set close to the shelter is helpful.

In making shelters, remember that snow is a good insulator. In timberless country, make a

simple snow cave or burrow by digging into the side of a snowdrift and lining the hole with grass or brush. Snow caves must be ventilated. If the snow is not deep enough to support a roof, dig a trench in a drift and roof it with snow blocks or other materials.

In wooded country, make a tree-pit shelter if snow is deep enough. Enlarge the natural pit around a tree trunk and roof it with any available covering.

Prevent carbon monoxide poisoning by providing good ventilation in closed shelters in which a fire is burning.

Do not sleep directly on the snow. Put insulation under your sleeping bag or body. Lay a thick bough bed shingle fashion; or use seat cushions, a parachute canopy, or even an inverted and inflated life raft if available.

ARCTIC SUMMER.— If you stay with the aircraft, use it for shelter. Cover openings with netting or parachute cloth to keep insects out. Do your cooking outside to avoid carbon monoxide poisoning. Make your fire at a safe distance from the aircraft.

Make a simple outdoor shelter by hanging a parachute over the wing of the aircraft; anchor the ends to the ground by weighting them down with stones. You can quickly improvise a tent by placing a rope or pole between two trees or stakes and draping a parachute over it; make the comers fast with stones or pegs.

Shelter against rain and insects will be needed. Choose a campsite near water but on high, dry ground if possible. Stay away from thick woods, as mosquitoes and flies will make your life miserable. A good campsite is a ridgetop, the shore of a cold lake, or a spot that gets an onshore breeze.

A fine shelter for drizzly weather and protection against insects is a tepee made from the parachute. In it you can cook, eat, sleep, dress, and make signals—all without going outdoors. Use 6 panels of parachute for a two-man shelter and 12 to 14 panels for a three-man paratepee. This shelter is worth building if you decide to stay in one spot for some time.

Avoid sleeping on the bare ground. Provide some sort of insulation under yourself; soft boughs or an inflated life raft provides excellent insulation. Pick a bed site on level, well-drained ground free from rocks and roots. If you have to sleep on bare ground, dig depressions for your hips and shoulders and try out the site before you set up your shelter or spread your bedding.

Signaling

Build your fire on a platform so that it will not sink in the snow. A standing spruce tree near a timberline burns readily even when green. Build a "bird nest" of quickly flammable material in the branches to ensure a quick start. Tramp out signals in the snow. Fill them in with boughs, sod, moss, or water colored with fluorescent dye.

In brush country, cut conspicuous patterns in vegetation. In tundra, dig trenches; turn sod upside down at the side of the trench to widen your signal. A parachute tepee stands out in the forest or on the tundra in summer, especially at night with a fire inside.

Remember, sound does not carry well through snow. If the entire party is in a snow cave or igloo, you may not hear rescue aircraft. Keep someone on guard as a spotter. Build the spotter a windbreak but do not roof it.

Signal with smoke by day and bright flame by night. Add engine oil, rags soaked in oil, or pieces of rubber (matting or electrical insulation) to the fire to make black smoke; add green leaves, moss, or a little water to send up billows of white smoke. Keep plenty of spare fuel on hand.

Signaling aids, such as flares and smoke grenades, must be kept dry. Use them only when friendly aircraft are sighted or heard.

Signal with a flashlight or, if the aircraft landing lights are intact and you can get the engine to run, remove the lights and extend them for signaling; but do not waste the battery—save it for the radio.

Arrange your ground signals in big geometric patterns rather than at random-they will attract more attention that way.

Use the fluorescent dye available in the life raft or life preserver kit for signaling on water or snow. Use it carefully; a little goes a long way. Use it only downwind, because the fine dye will penetrate clothing or food. On rivers, throw it out into the current for a quick spread.

Water Problems

Water is not a serious problem in the Arctic. An abundant supply of pure water is available from streams, lakes, ponds, snow, and ice. Pollution should not be a problem. The Arctic is an area that is usually too cold for bacterial growth. Therefore, in the Arctic almost any source of water can be used.

During the winter, melt snow or ice for drinking water. Do not eat unmelted snow or

ice; this lowers your body temperature and thus reduces endurance. One way you can melt snow or ice for drinking water is to put ice or snow in a plastic water bag and place it between the outer layers of your clothing.

If your fuel supply permits, it is better to drink hot water in cold climates. Hot liquids area rapid and effective source of internal warmth.

DESERT SURVIVAL

There are more than 50 named deserts in the World. Deserts cover nearly one-fifth of the earth's land surface. Therefore, the aircrewman must have a good knowledge of desert survival.

Deserts have extreme temperatures; hot days and cool nights are common. You may think of a desert as always being hot and dry. However, in winter months, the desert can become a freezing nightmare.

Hazards

Lack of water and exposure to sun and heat are the big hazards to health in the desert. One to five percent dehydration will make you lose your appetite, become sleepy and nauseated, and begin to vomit. As dehydration goes up to 10 percent, dizziness results. You will have headaches, difficulty in breathing, tingling of the legs and arms caused by poor circulation, indistinct speech, and, finally, an inability to walk. Still, 10 percent dehydration generally causes no permanent ill effects. When dehydration exceeds 10 percent, you will become delirious, spastic, almost deaf, and barely able to see. The skin shrivels and becomes numb. At temperatures above 90°F, dehydration over 15 percent is generally fatal. At 85° and less, the body can stand up to 25 percent dehydration. Dehydration is quickly cured by water—in fact, only water can cure it.

When you are dehydrated, you don't have to worry about how much water you drink or how quickly you drink it if the water is warm or cool. Cold water, though, will upset the stomach.

Table 5-1 shows the number of days you can normally expect to survive on a given amount of water, according to temperature and whether you rest or walk at night until you are exhausted.

Aside from a lack of water, exposure to the sun is the foremost desert ailment. Stay under cover as much as possible. If you must be out in the sun, keep as much of your body covered as possible. Roll down your sleeves, button your collar and turn it up around your neck, keep your head covered, and, if possible, cover your face also. Tuck the legs of your pants into your socks and keep your shoes on. On any area of your body that is not covered with clothing, use a sunburn ointment. It is better to use it as a preventive than as a cure. Wear a cloth neckpiece to cover the back of your neck from the sun. If you have no hat, make a headpiece like that worn by the Arabs, as shown in figure 5-40. You can also adapt your pilot chute as a parasol for use in the desert.

Exposure to desert heat is dangerous. It may cause three different types of heat collapse—heat stroke, heat exhaustion, and heat cramps. Another desert danger is sun glare. Glare is extremely painful. You can avoid it easily by taking the proper precautions. Keep your eyes protected from the glare of the sun by darkening the bridge of the nose and the area beneath the

Table 5-1.—Survival Potential as Determined by the Amount of Water, Temperature, and Activity

	Max. Daily Shade Temp. °F	NO WATER	1 QUART	2 QUARTS	4 QUARTS	10 QUARTS	20 QUARTS
RESTING	120°	2 Days	2 Days	2 Days	2.5 Days	3 Days	4.5 Days
WALKING		1 Day	2 Days	2 Days	2.5 Days	3 Days	
RESTING	110°	3 Days	3 Days	3.5 Days	4 Days	5 Days	7 Days
WALKING		2 Days	2 Days	2.5 Days	3 Days	3.5 Days	
RESTING	100°	5 Days	5.5 Days	6 Days	7 Days	9.5 Days	13.5 Days
WALKING		3 Days	3.5 Days	3.5 Days	4.5 Days	5.5 Days	
RESTING	90°	7 Days	8 Days	9 Days	10.5 Days	15 Days	23 Days
WALKING		5 Days	5.5 Days	5.5 Days	6.5 Days	8 Days	

240.148

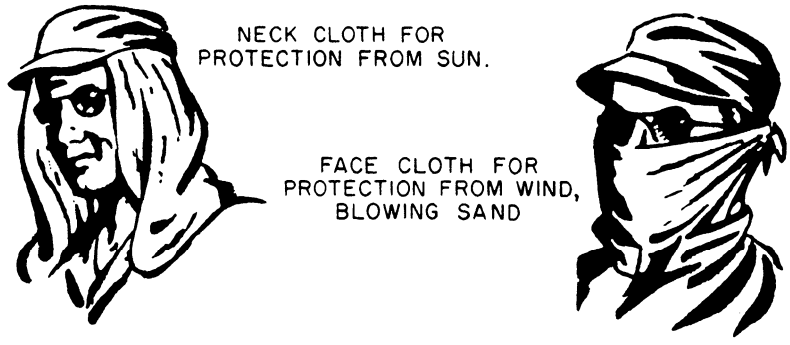

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Figure 5-40.—Face and neck protection.

eyes; use sunglasses or improvise a mask for your eyes.

Clothing

Clothing is your protection against sunburn, heat, sand, and insects. Clothing also helps you get along with less water. Keep your body and head covered. During dust storms, cover your mouth and nose as shown in figure 5-40—parachute cloth will do.

Keeping your clothing loose and flapping will help you stay cooler. Light-colored or white clothing is best because it reflects heat and light, whereas black or dark-colored clothing absorbs it. Wear your clothing at all times even though you imagine it will be cooler to strip it all off. It won't. Stripping off your clothing will cause your perspiration to evaporate too rapidly, and you will lose its cooling effects. Besides, the rapid evaporation of perspiration speeds up the process of dehydration.

Shelter

Shelter in the desert is important not only to protect you from the sun and heat but also to protect you from the cool of the night and occasional rain. Use whatever materials are available to improvise a suitable desert shelter. Your parachute can be used effectively to make a good shade and serve as a signaling aid at the same time. Several layers spaced apart provide good insulation from the sun. Use your inflated life raft turned upside down to elevate your bed off the desert floor. By using the parachute for shade and the life raft for insulation, you will be 20°F to 40°F cooler than you would be in the outside temperature.

You will need fire in the desert, not only for cooking and signaling but also for heat at night. In some deserts fuel is extremely rare. Wherever you find plant growth; save all twigs, leaves, stems, and underground roots for burning. Dry animal dung often found along travel routes provides a very hot flame.

Food

Eat sparingly unless you have plenty of water. Of course, dehydration will help you out on that score—it will decrease your appetite. Whatever food you do get, eat it immediately; food spoils rapidly in the heat. Don't try to preserve food by drying it. Dehydrated food is of little value if you don't have enough water.

In most deserts animals are scarce. Look for them at water holes; in grassy canyons or low-lying areas; dry riverbed areas, in which there is greater chance of moisture; or under rocks and in bushes. They are most likely to be seen at dusk or early morning. The most common animals are the small rodents (rabbits, prairie dogs, rats) and reptiles (snakes and lizards). They are your best and most reliable source of food.

Travel

Don't travel in the desert unless you are absolutely sure you can reach your destination on the water supply available. When the days are hot, travel only at night. Stay in the shade during the day and rest. Follow the easiest route possible—avoid soft sand and rough terrain. In the sand-dune areas follow the hard-floor valleys between the dunes or travel on the ridge of the dunes. Follow trails if at all possible.

Beware of flash floods when you are traveling along dry watercourses, particularly in the vicinity of mountains. You should never make camp in a stream bed; while rain in the desert is scare, storms can and do produce flash flooding very quickly.

TROPIC SURVIVAL

When used with reference to survival, the term *tropics* refers primarily to jungles, for those are the parts of the tropics that present survival problems distinctly different from those in other parts of the world.

Hazards

Most stories about the animals, snakes, spiders, and nameless terrors of the jungle are pure bunk. You are probably safer from sudden death in the jungle than in most big cities. You will probably never see a poisonous snake or a large animal. What may scare you most are the howls, screams, and crashing sounds made by noisy monkeys, birds, and insects.

The real dangers of the tropics are the insects, many of which pass on diseases. Probably the worst disease is malaria, which is transmitted by the mosquito. That is why the survival kit provides a mosquito headnet. Wear this net regularly, especially at dawn and dusk when mosquitoes are the thickest; use insect repellent, wear gloves, and take Atabrine pills too. A smudge fire also helps keep mosquitoes away, especially at dawn and dusk.

There are many other insects and pests in the jungle—ticks, leeches, scorpions, centipedes, and spiders, to name just a few. Stings or bites from these insects can create infection and cause illness. Frequently check your body and your clothing for insects and get rid of them. Beware of scratches also. In the jungle even the slightest scratch can cause serious infection within hours.

Clothing

As with the Arctic and the desert, clothing in the tropics serves as a protection against exposure, insects, and plant life. You should keep your sleeves rolled down and buttoned. Tuck the legs of your pants into your socks and keep your shoes on. This may help keep out unwanted insects such as ticks, leeches, and ants. Always wear full clothing in the tropics. By wearing your clothing loosely, your body will be cooler. Change your clothing as often as it is practical. Remember dirty clothes may lead to a skin infection; therefore, they should be washed daily, especially your socks.

Food and Water

Food and water are plentiful in the jungle. It is a proven fact that a person can survive in the jungle and actually like it, if provided with a basic knowledge of how to use the animals and other food found in the jungle. When you are selecting food in the jungle, watch the monkeys. Almost everything a monkey eats is eatable by humans. There are fish in all jungle streams. Eat only fish that have scales and look typically like a fish. Fish that have slimy skin and unusually shaped bodies are to be avoided.

Shelter

Night in the jungle comes very fast. So prepare for bed early. In the jungle you need more sleep than usual to keep up your energy and strength and to maintain resistance against disease.

Try to pick a campsite on a knoll or high spot in an open place well away from swamps. You will be bothered less by mosquitoes, the ground will be dryer, and there will be more chances of a breeze. Don't build a shelter under large trees or trees with dead limbs. They may fall and wreck your camp or cause injury. Don't sleep or build a shelter under coconut trees.

In the wet jungle forest, you will need shelter from the dampness. If you stay with the plane, use it for shelter. Try to make it mosquitoproof by covering the openings with netting or parachute cloth.

In mountainous jungle, the nights are cold. Get out of the wind. Make a fire a few feet from a cliff or against a log or rock pile, and build your shelter so that you get reflected heat. Arrange the reflector so that the fire doesn't blow toward you.

FIRE MAKING

You may need fire for warmth, for keeping dry, for signaling, for cooking, and for purifying water. Do not build a big fire. Small fires require less fuel, are easier to control, and their heat can be concentrated. In cold weather small fires arranged in a circle are much more effective than one large fire.

Preparing a Fireplace

Prepare the location of the fire carefully. Clear away leaves, twigs, moss, and dry grass so that you do not start a grass or forest fire. If the surrounding vegetation is dry, scrape the fire location down to the bare dirt. If the fire must be built on wet ground, build a platform of logs or flat stones.

To get the most warmth and to protect the fire from wind, build it against a rock or wall of logs that will serve as a reflector to direct the heat into your shelter. Cooking fires should be walled in by logs or stones, not only to concentrate the heat but also to provide a platform for the cooking pot.

Kindling and Fuel

Some fuels cannot be ignited directly from a match. You will need some easily flammable kindling to start a fire. Good natural kindling materials are thin sticks of dry wood; dry bark; wood shavings; palm leaves; twigs; loose, ground-lying lichens; dead, upright grass straw; or ferns. If sticks are used for kindling, split them and cut long thin shavings, leaving the shavings attached (shave stick). Store kindling in a shelter to keep it dry. A little JP-5 poured on the fuel before it is ignited will help it start burning. Do not pour petroleum fuel on a fire already started even if it is only smoldering.

For fuel, use dry, standing, dead wood and dry, dead branches. Dead wood is easy to split and break-pound it on a rock. The inside of fallen tree trunks and large branches may be dry even if the outside is wet; use the heart of the wood. Green wood that will burn, especially if freely split, can be found almost everywhere. In treeless areas, you will look for other natural fuels, such as dry grass that can be twisted into bunches, dried animal dung, and animal fats; sometimes you can even find coal, oil shale, or oily sand lying on the surface. If no natural fuels are available and you are with the aircraft, burn aircraft fuel and lubricating oil or a mixture of each. Hydraulic fluid is specifically designed and manufactured not to burn; therefore, it should not be used.

Fire Making With Matches and Lighter

Prepare a fireplace. Get all materials together before trying to start the fire. Make sure that matches, kindling, and fuel are dry. Have enough fuel on hand to keep the fire burning. Arrange a small amount of kindling in a low pyramid. Arrange the kindling close enough together to permit flames to lick from one piece to another. Leave a small opening for lighting.

Save matches by using a candle (if available) to light the fire. If you have no candle, use a shave stick or make a faggot of thin, dry twigs, tied loosely. Shield the match from the wind as you light the candle or faggot. Apply the lighted candle or faggot to the lower windward side of the kindling, shielding it from the wind.

Small pieces of wood or other fuel can be placed gently on the kindling before lighting or can be added after the kindling begins to burn. Lay on smaller pieces first, adding larger pieces of fuel as the fire catches. Do not smother the fire by crushing the kindling with heavy wood. Do not make the fire too big. Do not waste fuel.

Fire Making With Special Equipment

A flare can be used to start a fire; however, it should be used only as a last resort. Some emergency kits contain small fire starters, wind-proof matches, and other aids.

Fire Making Without Matches

First, find or prepare one of the following kinds of tinder: very dry, powdered wood; finely shredded, dry bark; the shredded pith of a dead palm frond; lint from unraveled cloth, cotton, twine, or rope; first-aid gauze bandage; fuzzy or woolly material scraped from plants; fine bird feathers or birds' nests; field-mouse nests; or fine wood dust produced by insects, often found under bark of dead trees. Tinder must be bone dry. Tinder will burn more easily if you add a few drops of aircraft fuel or mix it with powder taken from a cartridge. Once tinder is prepared, put some in a waterproof container for future use.

Once you have the tinder, light it in a place sheltered from the wind. Several additional methods of starting a fire are described in the following paragraphs.

Flint and Steel

Striking sparks with flint and steel is the easiest and most reliable way of starting a fire without matches. Use the flint fastened to the bottom of the waterproof match case. If you have no flint, look for apiece of hard rock from which you can strike sparks. If it breaks or scars when struck

with steel, throw it away and find another. Hold your hands close over the dry tinder; strike the flint with a knife blade or other small piece of steel with a sharp, scraping, downward motion so that the sparks fall in the center of the tinder. Adding a few drops of JP-5 to the tinder before you strike the flint will make the tinder flame up-for safety, keep your head to one side. When the tinder begins to smolder, fan it gently into a flame. Then transfer the blazing tinder to the kindling pile or add kindling gradually to the tinder. The wrist compass furnished in the individual survival kit (SRU-31/P) can be used to locate/identify iron-base lodestone.

Burning Glass

Any convex lens can be used in bright sunlight to concentrate the sun's rays on the tinder and start it burning.

Friction

There are many methods of making fire by friction (bow and drill, fire plough, fire thong, etc.), but all require practice. If you are proficient in one of these methods, use it; but remember that flint and steel will give the same results with less work.

Electric Spark

If you are with the aircraft and have a live storage battery, direct a spark onto the tinder by scratching the ends of wires together to produce an arc.

Burning Aircraft Fuel

If you are with the aircraft, you can improvise a stove to burn jet fuel, lubricating oil, or a mixture of them. Place 1 to 2 inches of sand or fine gravel in the bottom of a can or other container and add fuel. Be careful when lighting; the fuel may burst into flames at first. Make slots at the top of the canto let flame and smoke out, and punch holes just above the level of the sand to provide a draft. To make a fire burn longer, mix fuel with oil. If there is no container, simply dig a hole in the ground, fill it with loose dirt, pour on fuel, and light; take care to protect your face and hands. Always ensure that you handle fuel carefully to prevent spilling it on your clothing.

You can use lubricating oil with a wick arrangement for fuel. Make the wick of string, rope, rag, or even a cigarette, and rest it on the edge of a receptacle filled with oil. Also, soak rags, paper, wood, or other fuel in oil, and throw them on the fire.

You can also make a stove out of any empty waxed ration carton by cutting off one end and punching a hole in each side near the unopened end. Stand the carton on the closed end; stuff an empty sack loosely inside the carton, leaving an end hanging over the top; light this end—the stove will burn from the top down and will boil more than a pint of water.

Useful Hints

Do not waste matches by trying to start a poorly prepared fire. Do not use matches for lighting cigarettes; get alight from the fire or use a burning lens. Do not build unnecessary fires; save your fuel. Practice primitive methods of making fires before all the matches are gone.

Carry some dry tinder with you in a water-proof container. Expose it to the sun on dry days. Adding a little powdered charcoal will improve it and allow the tinder to stay dry, as the charcoal will absorb small quantities of water vapor from the humidity. Collect good tinder wherever it can be found.

Collect kindling along the trail before making camp. Keep firewood dry under shelter. Dry damp wood near the fire so that it can be used later. Save some of the best kindling and fuel for quick fire making in the morning.

To split logs, whittle hardwood wedges and drive them into cracks in the log with a rock or club; split wood burns more easily.

To make a fire last overnight, place large logs over it so that the fire will burn into the heart of the logs. When a good bed of coals has been formed, cover it lightly with ashes and then dry earth. In the morning the fire will still be smoldering.

Fire can be carried from one place to another in the form of a lighted punk, smoldering coconut husk, or slow-burning coals. When you want a new fire, fan the smoldering material into flame.

Do not waste fire-making materials. Use only what is necessary to start a fire and to keep it going for the purpose needed. Put out the fire upon leaving the campsite.

ARCTIC.— Do not build a fire under a snow-covered tree-snow may fall and put out the fire.

Low, dead, needle-bearing branches of standing spruce trees are good fuel. On the tundra, wood is scarce. Look for any woody bush or shrub; burn roots as well as stems. Look for dry twigs in willow thickets or for dry grasses. On the coasts, look for driftwood.

Animal fat and bones can be used as fuel. Put chunks of fat on a stick or bone framework or on top of a perforated can with a wick of greasy cloth or sphagnum moss underneath, and light the wick. Congealed oil can be burned in the same way.

A candle burning in a tin can makes a simple heater for the shelter.

In cold weather, drain oil from the aircraft and store it for fuel. If the temperature is not low enough to solidify the oil, leave it in the aircraft and drain it off when needed.

TROPICS.— In the tropics, wood is plentiful. Even if it is wet outside, the heart of dead wood will be dry enough to burn. Dry wood can also be found hanging in the network of vines or lying on bushes.

In palm country, good tinder can be obtained from the fibers at the bases of palm leaves. The insides of dry termite nests make good kindling.

Keep spare wood dry by stowing it under the shelter. Dry out wet kindling and fuel near the fire for future use.

SURVIVAL SELF-TREATMENT FIRST AID

During a survival situation the one thing that can jeopardize the aircrewman's ability to survive is a medical problem. Injuries incurred during ejection, parachute descent, and/or parachute landing can reduce survival expectancy as well as compromise the ability to evade the enemy.

Military personnel must be able to treat their injuries and sicknesses in a survival situation. The treatments described in this chapter are suitable for application by nonmedical personnel.

Some of the first-aid procedures described may be substandard compared with present medical standards within U.S. medical facilities. However, in a survival situation, they will increase your survival expectancy.

Health and Hygiene

In a survival situation, cleanliness is more than a virtue. It is essential if infection is to be prevented. Since skin is the first line of defense for your body, you must give particular attention to the washing of your face, hands, armpits, groin, and feet to minimize the chance of small scratches and abrasions becoming infected. Keeping the hands clean is especially important because most germs are introduced to the body by the hands. Keep fingernails short to prevent scratches; scratches as well as cuts and insect bites can cause serious infections, especially in the tropics. If an antiseptic is available use it on even the smallest of scratches or insect bites. Remember, an infection may hurt your chances of survival.

Clean clothes help to prevent infections and chafing, especially fungal infections that are common in the tropics. If washing clothes is not possible, at least shake and air clothing in the sun.

Soap is not essential to keeping clean. A substitute of ashes, sand, loamy soil, or other expedients may be used in cleaning the body and the utensils used in cooking and eating.

Intestinal Illnesses

Contaminated water or spoiled food, fatigue, overeating in hot weather, or using dirty utensils may cause diarrhea and other intestinal illnesses. Cook or wash food carefully before eating. When possible, purify water by boiling for 10 minutes; this will leave no doubt as to water purity at any altitude. If diarrhea does occur, the following field treatments may be used:

- Rest and fast, except for drinking water, for the first 24 hours; then take only liquid foods, and avoid starches.

- Eat several small meals instead of one or two large ones. Drink tannic tea or eat clay, chalk, or charcoal. Once the diarrhea has stopped, do not worry about lack of bowel movement. This will take care of itself in a few days provided you have an ample daily supply of water.

Foot Care

If traveling afoot in a survival situation, you should take particular care of your feet. Remove clots of material from socks to eliminate possible sources of friction and ensure that shoes fit properly. If possible, air your shoes and socks at night by putting them on small stakes. This keeps the insides dry and eliminates the danger of insects crawling inside. Watch for blisters and apply adhesive tape smoothly to your skin

wherever shoes rub. If you have blisters and they burst, leave the skin in place and apply a clean dressing. Carrying an extra pair of socks in your survival vest is suggested. At least once per day, clean, dry, and massage your feet to ensure adequate circulation. Remember, trench foot is caused by prolonged exposure to wet, usually cold, conditions; but it may be developed in the tropics. If symptoms of trench foot appear-that is, tingling, numbness, swelling, blisters, or sores—pay extra attention to your feet and give them proper care.

Control of Bleeding

The control of heavy bleeding is extremely important under all conditions, but it is of even greater importance in a survival situation since transfusions are not possible. When breathing ceases in conjunction with heavy bleeding, you must first take action to initiate breathing, then to stop the bleeding.

NOTE: Never apply a tourniquet unless that is the only way to stop bleeding from an extremity.

Restoration of Breathing

When breathing signs are absent, the most common cause is blockage of the airway. If normal first-aid procedures fail to clear the airway and restore breathing, you have one alternate procedure. This procedure is called a cricothyroidotomy and can be performed successfully by unskilled nonmedical personnel. To perform a cricothyroidotomy, proceed as follows:

1. Locate the thyroid cartilage (Adam's apple), which is the largest bony protrusion in the center line of the neck.
2. Locate the cricoid cartilage (the first circular ridge below the Adam's apple). The point of incision is the depression immediately above the cricoid cartilage.
3. Using a sterile surgical razor blade, if available, or any other cutting instrument in an emergency, make a lateral incision one-fourth to one-half of an inch wide and approximately one-fourth of an inch deep into the trachea.
4. Insert the lower half of a ball-point pen barrel or any similar rigid tube into the incision one-half to three-fourths of an inch or until movement of air is felt or heard.
5. Secure the tube with tape if it is to be left in place for an extended period of time or if the victim is to be transported.

Control of Pain

Control of pain accompanying disease or injury is extremely difficult because pain cannot be measured. The severity of pain accompanying any disease or injury is relative to the individual's ability to withstand or cope with that pain. Although some individuals can tolerate a great deal of pain, others cannot. Psychological injury may alter an individual's pain threshold. Regardless of this difficulty, every effort should be made to control or eliminate pain, not only because of its adverse effect on morale, but also because it contributes to shock and makes a survivor less capable of performing other essential tasks. The ideal method for pain reduction is to eliminate its cause. Since this is not always possible, the following methods are recommended:

- Reduce movement of the painful area. Immobilize the wounded area in a position that provides maximum comfort and ease of maintenance. Use splints and bandages.

- Apply a clean dressing that will protect the wound from the air and from painful contacts with objects in the environment.

- Apply hot or cold compresses. Try both hot and cold compresses to determine which offers the most relief.

- A common injury sustained by downed aircrew members is broken teeth. This results in extreme pain because the nerves are exposed to air. To ease the pain, take the following steps:

- Cover broken teeth with pine or other tree saps or any waxy substance.

- Drink tea made from the boiled inner bark of a willow tree. The bark contains an active substance called salicylate, which is an aspirin substitute. Aspirin will prevent blood from clotting. Pain-relieving drugs should be given sparingly, and then only to relieve true pain, not to soothe the victim's apprehension. The only ready-made pain reliever available to aircrew members is the aspirin located in the SRU-31/P Medical Packet #1.

Control of Shock

Shock is frequently the most serious consequence of an injury. You should become familiar

with the signs and symptoms of shock so that the condition may be anticipated, recognized, and dealt with effectively. The best approach to shock treatment is to treat all survivors suffering from moderate and severe injuries for shock. Act! Don't wait! Anticipate shock and take care of it along with treatment of the specific injury.

● Giving a survivor fluids by mouth in the treatment of shock is normally not recommended. However, in survival situations, recovery may often depend on adequate hydration. In an early shock incident, giving the survivor small amounts of fluid by mouth maybe beneficial, provided he is conscious, can swallow, and has no internal injuries. Burn victims particularly need large amounts of water to replace their loss of fluids.

● Emotional shock frequently follows an emergency. This type of shock originates in the mind and may occur even without injury. Resistance to and the impact of this type of shock varies widely. It depends on your physical makeup and is related to the amount of training you have previously received. Comfort and reassurance coupled with rest and relaxation after you are clear of immediate dangers is very effective in management of the survivor suffering from emotional shock.

Symptoms of Shock

A person suffering from shock shows symptoms that are directly or indirectly related to the poor circulation of the blood. The pulse is weak and rapid. Breathing is likely to be shallow, rapid, and irregular, because the poor circulation of the blood affects the breathing center in the brain. The temperature near the surface of the body is lowered because of the poor blood flow; therefore, the face, arms, and legs feel cold to the touch. Sweating is likely to be very noticeable. A person in shock is usually very pale, but in some cases there may be a bluish or reddish color to the skin. The pupils of the eyes are usually dilated (enlarged).

If the victim is conscious, he may complain of thirst. He may have a feeling of weakness, faintness, or dizziness. He may feel nauseous. Also, the person may be very restless and feel frightened and anxious. As shock deepens, these signs gradually disappear and the victim becomes less and less responsive to what is going on around him. Even pain may not arouse him. Finally, the victim may become unconscious.

It is unlikely that you will see all these symptoms of shock in any one case. Some of them appear only in the late stages of shock when the disturbance of the blood flow has become so great that the victim's life is in serious danger. Sometimes the signs of shock maybe disguised by other signs of injury. It is important to know what symptoms indicate the presence of shock, but do not ever wait for symptoms to develop before beginning the treatment for shock. Remember, EVERY SERIOUSLY INJURED PERSON IS LIKELY TO DEVELOP SERIOUS SHOCK.

Treatment of Shock

In many emergency situations, the most helpful thing you can do for an injured person is to begin treatment for shock. If shock has not yet developed, the treatment may actually prevent its occurrence; if it has developed, you may be able to keep it from reaching a critical point. As we have seen, shock creates a vicious cycle—that is, the worse it is, the worse it becomes. It is extremely important that you begin treatment at the earliest opportunity.

It is important to keep the victim as calm as possible because excitement and fright will affect his condition and may even bring on shock. Try to prevent the victim from seeing his injuries, and reassure him that he will be properly cared for. Keep all unnecessary persons away, as their conversation regarding the victim's injuries may increase his agitation.

A person in shock is often thirsty. No particular harm will be done if you allow the victim to moisten his mouth and lips with cool water, if it will make him more comfortable. But in general, there is no need to give him anything to drink unless you are in a position where medical assistance will not be available for an excessively long period of time.

If medical care will not be available, you should give the victim SMALL AMOUNTS of warm water, preferably mixed with 1 teaspoon of salt and 1/2 teaspoon of baking soda per quart or liter. This should be done if he is conscious, able to swallow, and has not suffered internal injuries.

In the case of burns, an exception must be made to the rule of not giving liquids. A seriously burned person has an overwhelming need for fluids. It is, therefore, a permissible and even desirable part of first-aid treatment for burns to give water or other liquids. Sweet tea, fruit

juices, or sugar water maybe given if the casualty is conscious and able to swallow, if he has no internal injuries, and if vomiting is no problem.

One final precaution must be given concerning the use of liquids: NEVER GIVE ALCOHOL TO A PERSON IN SHOCK OR WHO MAY GO INTO SHOCK. Alcohol increases the blood supply to surface vessels and so diminishes the blood supply to the brain and other vital organs.

Heat is important in the treatment of shock to the extent that the injured person's body heat must be conserved. Exposure to cold, with resulting loss of body heat, can cause shock to develop or to become worse. You will have to judge the amount of covering to use by considering the weather and the general circumstances of the accident. Often alight covering will be enough to keep the casualty comfortable. Wet clothing should be removed and dry covering provided, even on a hot day. Use blankets or any dry material to conserve body heat. Artificial means of warming (for example, hot-water bottles, heated bricks, or heated sand) should not be ordinarily used. Artificial heat may cause the loss of body fluids (by sweating), and it brings the blood closer to the surface, thus defeating the body's own efforts to supply blood to the vital organs and to the brain. Also, the warming agent may burn the victim. KEEP AN INJURED PERSON WARM ENOUGH FOR COMFORT, BUT DO NOT OVERHEAT HIM.

The best position to use for the prevention or treatment of shock is one that encourages the flow of blood to the brain. If it is possible to place the injured person on his back on a bed, cot, or stretcher, you can raise the lower end of the support about 12 inches so that his feet will be higher than his head. If the circumstances of the accident make it impossible to do this, it might still be possible for you to raise his feet and legs enough to help the blood flow to the brain. Sometimes it is possible to take advantage of a natural slope of ground and place the casualty so that his head is lower than his feet.

In every case, of course, you will have to consider what type of injury is present before you can decide on the best position. For example, a person with a chest wound may have so much trouble breathing that you will have to raise his head slightly. If the face is flushed rather than pale, or if you have any reason to suspect head injury, do not raise the feet. Rather, you should keep the head level with or slightly higher than the feet. If the person has broken bones, you will have to judge what position would be best both for the fractures and for shock. A fractured spine must be immobilized before the victim is moved at all, if further injuries are to be avoided. If you have any doubts about the correct position to use, have the victim lie flat on his back. THE BASIC POSITION FOR TREATING SHOCK IS ONE IN WHICH THE HEAD IS LOWER THAN THE FEET. Do the best you can, under the particular circumstances, to get the injured person into this position. In any case, never let a seriously injured person sit, stand, or walk around.

Distinguishing Characteristics of Poisonous Snakes

The first step to treating a snakebite is to determine whether the snake is poisonous. Many harmless snakes bite in self-defense. Distinguishing characteristics that help to determine if the snake is poisonous follow:

VIPERS.— The viper has two long, folding fangs at the front of the upper jaw. A pit viper also has a small, deep pit between the eyes and the nostrils, slit-like pupils of the eyes, and a flat, triangular head; the scales behind the anus are in one piece. Rattlesnakes, copperheads, and moccasins are pit vipers; all vipers are poisonous.

CORALS.— The coral snake has a black nose and brightly colored bands of either red, black, and yellow or red, black, and white. On coral snakes the black and red are separated by yellow or white; on the nonpoisonous (false coral) snake, the yellow and red are separated by black. It has short, grooved fangs and must chew into its victim before the poison can be injected. The coral snake is related to the cobra and the krait.

COBRAS.— The combat attitude of the cobra is with the forepart of the body raised vertically and the head tilted sharply forward. Usually the neck is flattened to form a hood. These snakes are very poisonous and should be avoided. Adders are related to the cobra and can be found throughout the continental United States.

TREATMENT OF SNAKEBITES.— Prompt action to reduce the effects of poisonous snakebites is essential. The following is a step-by-step treatment for snakebites:

1. Avoid undue exertion. If circumstances allow it, lie down and remain quiet. A snug

tourniquet (tight enough to impede the venous return of blood to the trunk, yet loose enough to allow arterial supply to the extremity) will further delay systematic absorption of the poison. Place a tourniquet between the bite and the heart, about 2 inches above the bite. A tourniquet should only be used if competent medical help is reasonably expected to take over management of a snakebite victim.

2. Clean a knife or razor blade and the fang marks by daubing with antiseptic, if available.

3. Make a small cut over each fang mark (deep enough, one-fourth of an inch or more, to penetrate the skin). Orient each cut parallel to vital structures (generally parallel to the long axis of the limb).

4. Apply suction. Suction can best be applied by mouth, but not if there are open oral lesions present. In this case, some other means of applying suction must be found. After 30 minutes, suction is of little benefit.

CARE OF WOUNDS.— Open wounds are a serious hazard in a survival situation, not only because of the tissue damage and blood loss, but also because of the increased possibility of infection. Little can be done to prevent wound contamination at the time of the injury. Proper wound care can minimize further contamination and promote healing and preservation of function in the injured part.

● Clothing should be cut or torn away from a wound; drawing clothes over the wound may introduce bacteria into the wound.

● Whenever possible, avoid touching the wound with fingers or any unsterile object. All water and instruments used in wound care should be sterilized by boiling. Washing your hands before you treat any wound is very important in keeping down infection.

● Clean all wounds as soon after occurrence as possible. Only antiseptics especially designed to use in open wounds should be used directly in the wound.

NOTE: Common antiseptics such as Merthiolate, iodine, and Mercurochrome should never be applied directly to a wound. These solutions destroy only part of the bacteria and actually damage the exposed tissues.

● When cleansing solutions for wounds are not available, a suitable substitute may be a poultice made of fern root. To prepare a poultice, you boil finely chopped roots in water until syrupy. Allow the poultice to cool and apply directly to the wound.

● The "open treatment" method is the safest way to manage wounds in a survival situation. No attempt should be made to close a wound by stitching. The wound should be left open to permit drainage of pus from infection. As long as a wound can drain, it generally will not become life threatening. If a wound is gaping, the edges can be brought together with adhesive tape cut in the form of a butterfly or dumbbell. When a butterfly bandage is applied properly, only a small portion of the adhesive is in contact with the wound; but a large surface of the tape is in contact with the skin on either side of the wound, providing traction that pulls the edges of the wound together. The narrow center permits some free drainage from the wound, and the strips can be removed easily if the wound has to be opened should infection develop.

Exposure

In certain climates, you will be exposed to excessive heat or cold and must safeguard yourself from its effects. Proper procedure is the key to prevention of all cases of heat or cold exposure.

HEAT.— Increased sweating requires more fluid intake. The duration of physical activity should be less during the first days of heat exposure and increased gradually as you become acclimatized. Alternate work and rest periods should be established. Avoid working in direct sun or on extremely hot days. Wear lighter clothing in hot environments.

COLD.— The most important aspect of prevention of cold-related injury is awareness of existing weather conditions and the likelihood of weather change. Adequate clothing to protect as much exposed skin as possible must be worn. Rain gear should be donned before you become wet; wool clothes and wind-protective garments should be donned before you start to shiver. Improvised clothing may be made from parachute material. Obtain shelter that provides protection from the wind, precipitation, and surface water as well as insulation from ground, snow, or ice. Improvised shelters, described in *Survival Training*

Manual, NAVAIR 00-80T-101, will be useful in combating exposure.

SNOW BLINDNESS.— Exposure to reflected sunlight from snow, ice, or water, even on grey overcast days, can result in sunburn of the tissues comprising the surface of the eye, as well as the retina, producing snow blindness.

Symptoms.— Symptoms may not be apparent until up to 12 hours after exposure. The eyes initially feel irritated and dry; then, as time passes, eyes feel as though they are full of sand. Blinking and moving the eyes may be extremely painful. The eyelids are usually red, swollen, and difficult to open.

Remedial Action.— A mild case will heal spontaneously in a few days, but you can obtain some relief by applying cold compresses and a lightproof bandage. An ophthalmic ointment can be applied hourly to relieve pain and lessen the inflammatory reaction.

WARNING

Do not rub your eyes.

Prevention.— Snow blindness can be prevented by constant use of sunglasses or a tinted helmet visor. If the glasses or helmet are lost, an emergency set of goggles can be made from a thin piece of leather, cardboard, or other lightproof material. Cut the material the width of the face with horizontal slits over the eyes. These improvised goggles can be held in place with string or cord from the parachute shroud lines attached to the sides and tied at the back of the head.

As a first class or chief petty officer, you must assume more responsibility for yourself and those around you. You will be the resident expert in matters of survival equipment. You will be expected to teach your subordinate maintenance personnel and your unit's aircrewmen as well. This means that you must continue to educate yourself by studying everything available related to survival equipment. You are a key factor in the survival of those entrusted to your care.